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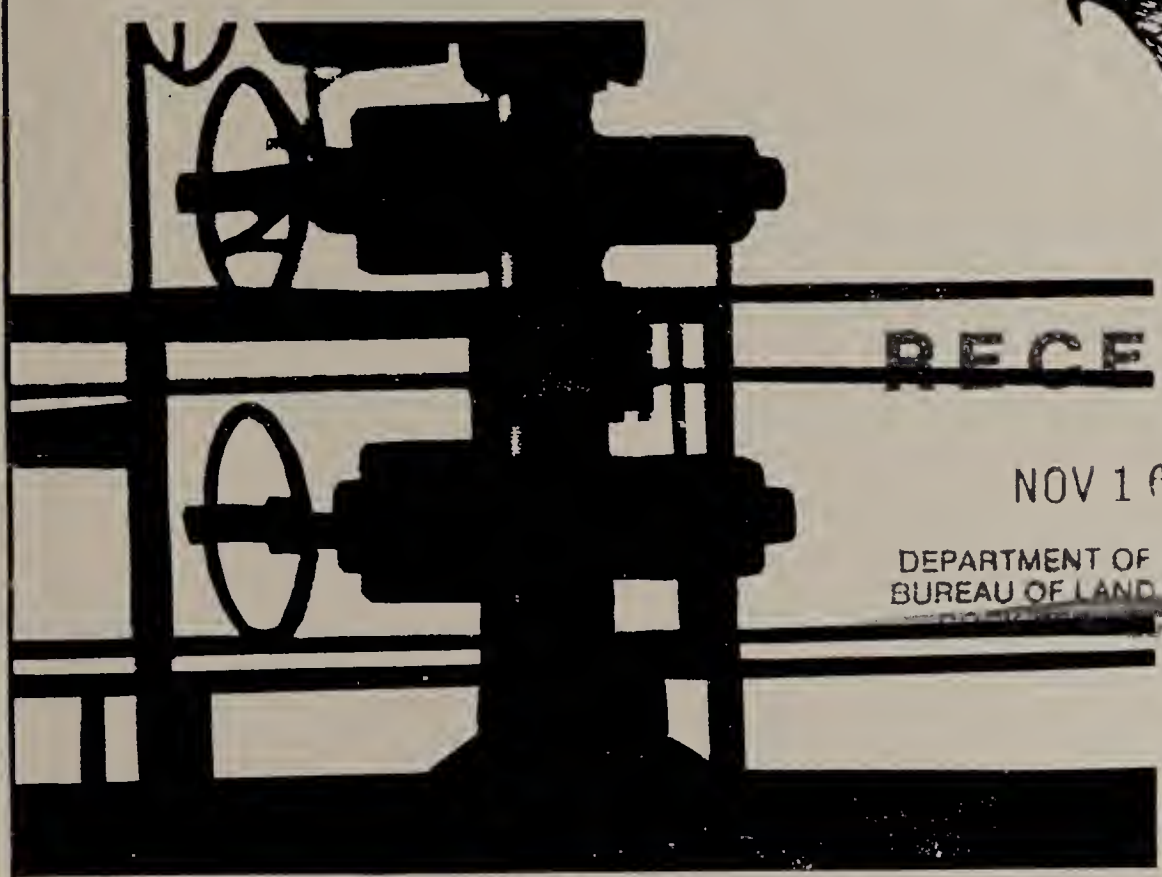
RILEY RIDGE NATURAL GAS PROJECT

SENSITIVITY ANALYSIS TECHNICAL REPORT

NOVEMBER 1983

Prepared by:
WESTERN RESEARCH
CORPORATION for

DEPARTMENT OF INTERIOR
BUREAU OF LAND MANAGEMENT
DEPARTMENT OF AGRICULTURE
FOREST SERVICE



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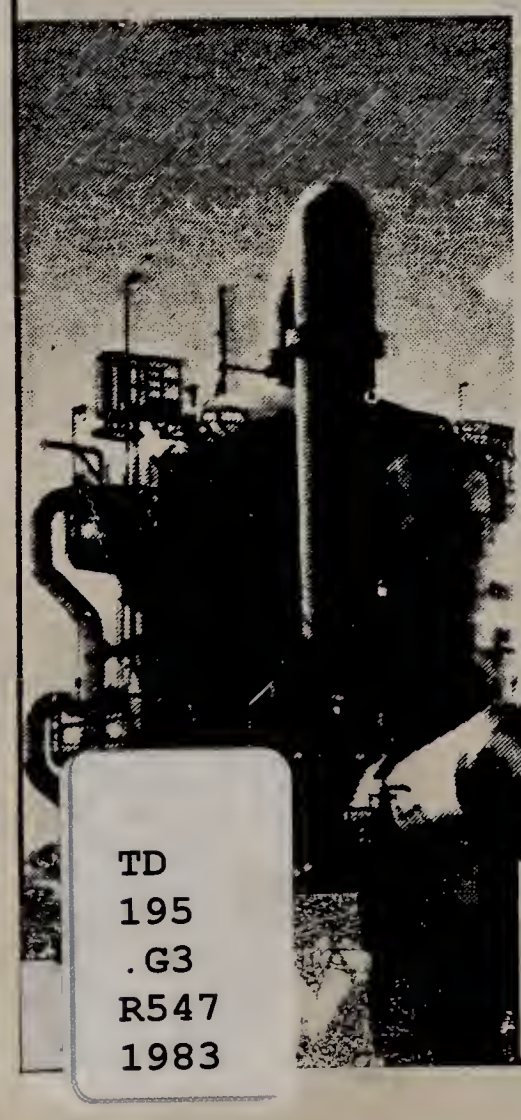

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WELL FIELD SENSITIVITY ANALYSIS SYSTEM
TECHNICAL REPORT

For the

RILEY RIDGE PROJECT
ENVIRONMENTAL IMPACT STATEMENT

Submitted by

ENVIRONMENTAL RESEARCH & TECHNOLOGY, INC.
Fort Collins, Colorado

November 1983

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CHAPTER 1

INTRODUCTION

The Sensitivity Analysis System Technical Report is one of a series of eight technical reports prepared by ERT as background and documentary material for the Riley Ridge Draft Environmental Impact Statment (DEIS). This unpublished technical report provides background information for a system of 18 natural resources and human resources overlays prepared as working tools to assist in management and permitting of the well field.

As specified in the statement-of-work, only the well field is depicted on the overlay. The linear facilities and their corridor routes outside of the well field are subject to change over time as markets for various products are identified. These corridors will require separate environmental analysis in the future. However, most of the intensive development will occur in the well field, and interagency coordination will be necessary to permit and manage the development. The overlays were prepared to assist agency personnel in becoming familiar with the sensitive resources within the well field.

The overlays depict critical resource elements that represent resource/ development conficts or constraints. The overlay system consists of 18 frosted mylar transparencies and a frosted mylar base map. The base map and overlays were prepared at a scale of 1:48,000. The resource information depicted on the overlays was collected and analyzed as part of the resource statements of work associated with the EIS and generally reflects data available in 1982.

This Technical Report, in the interest of brevity, useability, and consistency, does not reiterate or attempt to summarize the environmental impacts and conflicts identified and discussed in the DEIS and Technical Reports. Therefore, the user is reminded that extensive detailed information is available in the DEIS and seven technical reports covering

the Proposed Action; Socioeconomics; Health and Safety; Air Resources; Soils, Vegetation, and Reclamation; Wildlife and Fisheries; and Cultural Resources.

The technical report and overlays will be available to agency and company personnel responsible for permitting and planning activities in the well field. The overlays will be available for use in the Big Piney Ranger District of the Forest Service (FS), the Pinedale Resource Area of the Bureau of Land Management (BLM), and the Rock Springs District Office of the BLM.

The objectives for preparing the overlays and technical report were 1) to prepare a visual display of sensitive or critical resources in the well field, 2) create a tool for identifying potential conflicts and assisting in impact analysis, 3) provide quick access to solutions or mitigation measures, 4) aid agencies and companies in planning and approving permits, and 5) provide a system which can be easily updated and used for management and monitoring throughout the life of the well field.

Much of the success of the sensitivity analysis system in meeting these objectives will depend on the commitment of the agencies and companies to continually update the overlays and this technical report as new data becomes available through future permits and resource investigations.

CHAPTER 2

BASE MAP

The base map was prepared from USGS 7½-minute topographic quadrangle maps covering the well field (Figure 2-1). The maps were aligned and photographically reduced by 50 percent to prepare a map at 1:48,000 scale. On the map, 1 inch equals 4,000 feet.

The base map and overlays are printed on one side of the diazo mylar sheets. The overlays can be erased by gently scraping off the ink or by wiping off the ink with a dilute solution of Clorox and water. Additions to the overlays should be done in India ink on the side without printing. The base map can be combined with any of the overlays to print blueline maps. Reproduction of bluelines should be done on a flat frame to ensure alignment or by shooting another mylar of the base and overlay. The base map will align with each overlay using the punched holes as registration points. The overlays have been prepunched to fit on registration pins.

A variety of other map tools are available for the well field including the Bridger-Teton National Forest Map (1:126,720 scale) and the BLM Land Status Maps (1:126,720 scale). 1980 black and white ortho-photo-quads of the well field are available from the U.S. Geological Survey and Agricultural Stabilization and Conservation Service (ASCS) (1:24,000). The Big Piney Ranger District Office of the FS also has 1977 1:15,840 and high altitude true color photography for National Forest Lands. True color photography at 1:15,840 (1977) is also available for BLM managed lands. New 1983 true color photography was taken for the Pinedale Resource Area in the summer of 1983 and prints will be available in early 1984.

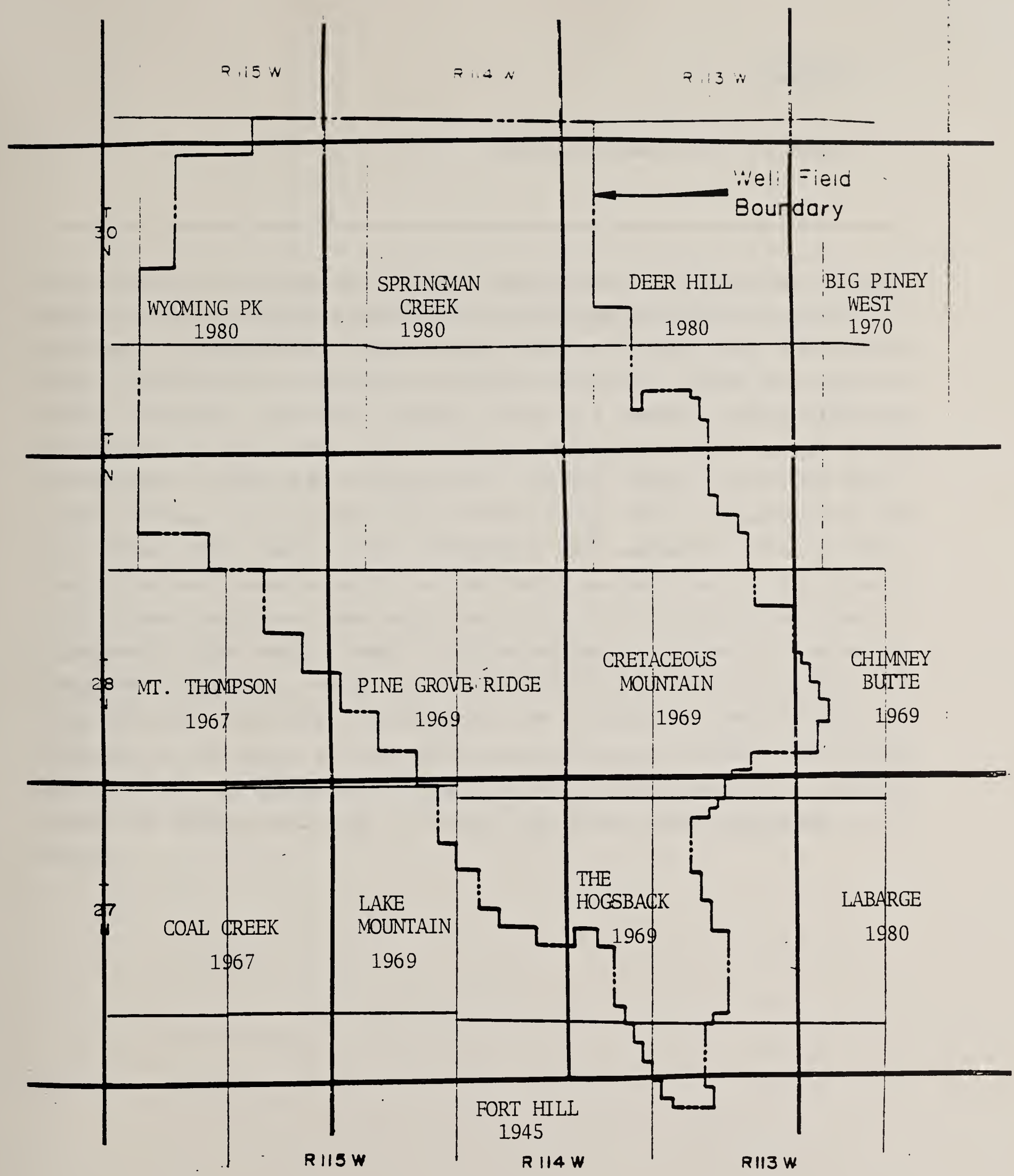

Figure 2-1. USGS 7½ minute topographic quadrangle maps covering the Riley Ridge well field.

CHAPTER 3

EXISTING FACILITIES - OVERLAY 1

The proposed Riley Ridge well field is approximately 160,000 acres in size. Much of this area has been developed over the past 40 years for shallow oil and sweet gas production, timber harvest, and recreational use. Much of the area, especially the southeastern portions of the well field, has numerous wells, pipelines, and road networks. Overlay 1 presents major roads and facilities in the well field based on topographic quad maps, aerial photography and the BLM individual well records (IWRs). Facilities built since 1977 are not depicted on the overlay except for the Fogarty Creek and Dry Piney Units where 1980 photography was available. The existing facilities are based primarily on the IWRs, available aerial photography (1977), and topographic quad maps (see Figure 2-1 for publication dates of topographic quad maps). Maps illustrating major gas and oil gathering pipeline networks and trunk lines could not be obtained for inclusion on this overlay. Individual rights-of-way for pipelines on public lands are recorded on the master oil and gas plats maintained by the BLM State Office and available on microfiche in the district offices of BLM. This overlay should be updated over time to reflect the Riley Ridge development as it occurs.

CHAPTER 4

EXISTING SURFACE OCCUPANCY LEASE STIPULATIONS - OVERLAY 2

Since the Riley Ridge well field encompasses areas that have been leased for oil and gas development in the past, many areas have special stipulations currently affecting those leases. Many of the existing stipulations specify no surface occupancy in sensitive areas or specify set-backs from surface water resources. Overlay 2 illustrates portions of the well field having special stipulations which affect surface occupancy, other stipulations are not shown. In many cases the special stipulations apply only to specific lots within a lease. Given the scale of the map, many of these lots could not be accurately depicted. Therefore, the user is cautioned that special stipulations may not apply to the entire area coded on the overlay. The user should consult the master oil and gas plats available on microfiche in all BLM field offices and the State Office in Cheyenne. Overlay 2 illustrates special stipulations which affect surface occupancy. In addition to these requirements, all leases are affected by the general measures and oil and gas operating measures included as Appendix B in the DEIS. Each individual lease also specifies the following measures:

- In Roadless Areas and Wilderness, no road improvements will be allowed, special clearance is required from the FS
- Archaeological clearance will be necessary
- Endangered plant and animal species clearance will be required
- Existing roads will be maintained
- Visual impacts will be minimized
- Reclamation will be concurrent with operation
- The BLM District Manager will specify facility locations

CHAPTER 5

NATURAL RESOURCE OVERLAYS

Ten overlays were prepared to illustrate sensitive natural resources that could be affected by planned development. The content of the overlays was determined by 1) its potential use in helping plan development (such as the climatic zone, slope, and sensitive rehabilitation unit overlays), or 2) its sensitivity to development (e.g., raptor nests, critical big game range, springs and seeps). The overlays do not depict all potential natural resource/development conflicts, but only those that were determined to require special mitigation through the environmental impact assessment process documented in the DEIS. The user is advised to review the DEIS and Technical Reports (Soils, Vegetation, and Reclamation and Wildlife and Fisheries) to become familiar with the environmental issues pertinent to the project.

The overlays were prepared primarily from existing information and studies conducted in 1982 and 1983 for the DEIS. The sources, uses, and limits of the data presented on the overlays, as well as resource mitigation measures, are discussed by overlay in the following sections.

SURFACE WATER - OVERLAY 3

SOURCE

Perennial streams, lakes, and watershed boundaries were determined from 1:24,000 USGS topographic maps and 1:24,000 aerial photography. Springs and seeps were mapped based on a helicopter reconnaissance survey conducted by ERT in October 1982 in conjunction with other field studies. This survey did not reveal all of the existing springs and seeps; many areas could not be surveyed from the air because of snow cover or dense vegetative cover (such as timber). As a result the survey is most reliable for the eastern portion of the well field, since this area has relatively sparse vegetation.

USE

This overlay should be used in determining the most environmentally sound location for permanent and temporary facilities relative to surface water resources. Since no other existing information is available on springs and seeps in the well field, the results of ERT's limited survey are presented as a "starting point" for locating these important water resources. Since many streams in the well field are fed by springs and seeps, interference with groundwater quality or quantity may be first identified by effects observed in springs and seeps. The user is cautioned that this map is not complete; the appearance that springs and seeps occur only in the eastern portion of the well field is an artifact of the method used in surveying. Therefore, this overlay should not be considered as the only data source when determining the need for special measures to protect surface water resources.

STIPULATIONS AND MITIGATIONS

Surface water resources supply water for domestic and livestock use and fish and wildlife habitat in the well field, including habitat for sensitive aquatic species like the Colorado River cutthroat trout (see Overlay 12, Wildlife - Other Species). Several general and special measures have been developed to protect surface water, they are listed below by category. In addition, several state agencies are charged with protecting water resources; these agencies and their permit authority is summarized in Chapter 2 of the DEIS.

Committed Mitigation Measures

Agency Management Committed Measures (from the EIS).

Measure. Because of the data gaps in the DEIS on composition of water to be injected, injection procedures, and surface and bottom locations, all injection wells on federal lands to be used for plant waste water are not covered in sufficient detail by the DEIS. Consequently, all injection wells for plant waste water disposal on federal lands, including those on plant rights-of-way, will need an EA or other NEPA

compliance prior to approval. This may be facilitated by the applicant for Wyoming DEQ permits also submitting that information to the BLM for analysis.

Measure: All injection wells must be designed in accordance with the Wyoming DEQ and the Wyoming Oil and Gas Commission. In addition, those on federal minerals must have the approval of the BLM Minerals Division.

Uncommitted Mitigation Measures

In addition to the committed measures above, ERT prepared a surface water monitoring plan for the well field. The monitoring program was prepared after the end of the water year (in October 1983) and is included as an appendix to the FEIS and as Appendix C of this repot. BLM Oil and Gas Technical Bulletin No. 1 (1981) also recommends that wells be set-back 500 feet from "live" water.

Applicants Standard Operating Procedures

- Cement plugs would be placed at designated depths in the well to prevent migration of water or hydrocarbons and to protect any freshwater aquifers from contamination in accordance with applicable state and federal regulations.

- Where the pipeline crosses rivers, the river crossing points would be carefully selected to minimize disturbance of riverbeds or banks.

- Creek flow would be maintained during pipeline construction. When crossing creeks with muddy bottoms, downstream sedimentation would be minimized by implementation of the following techniques: (1) Creeks flowing in areas where the channel is narrow would have the flow diverted around the construction area by blocking the channel upstream of the crossing site and diverting the flow through the use of pumps and/or flumes; (2) Creeks flowing in relatively flat areas where the channel is wide would have the flow diverted around the construction area by blocking a portion of the channel upstream of the crossing site. After construction is completed in that portion of the channel and the creek bottom is restored, then that portion of the channel would be reopened and the other portion blocked for construction.

- Every effort would be made to minimize the effects of construction on water flow. Upon completion of construction, the gradient of the stream would be restored as nearly as practical. Stream banks

would be restored to resemble original grade, and breakers or riprap would be placed along riverbanks where necessary to control erosion.

- During construction of river crossings, the drainage or storm runoff from riverbank staging areas would be controlled via detention basins, evaporation pits, or straw bale filters to ensure that levels of suspended solids, grease, or oil would not exceed receiving water standards.

- Specific construction techniques would be selected for each creek crossing that would minimize erosion and siltation. Where the creek has a solid gravel base, permission would be requested for vehicle crossings; where an access road is in proximity, the existing access road would be used. Where the flow is too deep for vehicles to cross or the creek has a muddy bottom and there is no access road in proximity, flume pipes would be installed in the creek bottom and a roadway constructed on top for vehicle passage.

  Where the pipeline would cross creeks, the supports would be located and would be of such a depth, that high water would not affect the pipeline through scour action. Construction of creek crossings would be made in a manner that minimizes the effects of construction on water flow. The gradient of the stream would be maintained by removing all spoil from the creek bed upon completion of construction, and the creek banks would be restored.

- Quasar, Exxon, and Northwest would dispose of miscellaneous solid waste in an off-site approved sanitary landfill which has not been identified. Scrap metal produced by project construction would be sold to a recycling firm. Used oils, lubricants, and solvents generated during both the construction and operations phase of the project would be collected in tanks on the plant site until sufficient quantities are accumulated to sell these wastes to a re-refining firm.

Special Lease Stipulations

Several measures are currently in effect in portions of the well field. See Overlay 2.

Well Field Oil and Gas Operating Measures

- All shows of fresh water and minerals will be reported and protected. A sample will be taken of any water flows and furnished to the Authorized Officer for analysis. All oil and gas shows will be adequately tested for commercial possibilities, reported, and protected.

- Whether the wells are completed as dry holes or as producers, the "Well Completion and Recompletion Report and Log" (Form 9-330) will be furnished to the Authorized Officer not later than 15 days after completion of the well or after completion of operations being performed, in accordance with 30 CFR 221.32(b). Two copies of all logs run, core descriptions, core analyses, well-test data, geologic summaries, sample descriptions, and all other surveys or data obtained and compiled during the drilling, workover, and/or completion operations, will be filed with Form 9-330. Samples (cuttings, fluid, and/or gas) will be submitted only when requested by the Authorized Officer.

- Pursuant to "Notice to Lessee - Disposal of Produced Water" (NTL-2B) requirements for new wells, these APDs are authorization for unlined pit disposal of the water produced from these wells for a period of 90 days from the date of initial production for sales purposes. During this period, an application for approval of the permanent disposal method, along with the required water analysis and other information must be submitted for the Authorized Officer's approval.

- All tank batteries constructed must be surrounded by a fire wall of sufficient capacity to contain the storage capacity of the batteries adequately.

- Discharges, spills, fires, accidents, or blowouts must be reported to the Authorized Officer in accordance with "Notice to Lessee - Reporting of Undesirable Events" (NTL-3A).

- The Authorized Officer should be notified sufficiently in advance of actual well plugging work so that a representative may have an opportunity to witness the well plugging operation.

- Holder shall give immediate notice of any spill or leakage, in violation of 43 CFR 110.5, of oil or other pollutant from the pipeline to: 1) the Authorized Officer; and 2) such other federal and state officials as are required by law to be given such notice. Any oral notice shall be confirmed in writing within 72 hours of any occurrence.

General Measures

- All activities associated with the project will be conducted in a manner that will avoid or minimize degradation of air, land, and water quality. In the construction, operation, maintenance, and termination of the projects, activities will be performed in accordance with applicable air and water quality standards, and related plans of implementation, including but not limited to, the Clean Air Act, as amended (42 USC 1321) and the Clean Water Act as amended (USC 1251).

- The Holder shall comply with the applicable federal and state laws and regulations concerning the use of pesticides (i.e., insecticides, herbicides, fungicides, rodenticides, and other

similar substances) in all activities/operations under this Grant. The Holder shall obtain from the Authorized Officer approval of a written plan prior to the use of such substances. The plan should be submitted no later than December 1 of any calendar year that covers the proposed activities for the next fiscal year (i.e., December 1, 1983, deadline for a fiscal year 1985 action). If need for emergency use of pesticides is identified, the use must be approved by the Authorized Officer. The use of substances on or near the right-of-way shall be in accordance with the approved plan. A pesticide shall not be used if the Secretary of the Interior has prohibited its use. A pesticide shall be used only in accordance with its registered uses and within other limitations if the Secretary has imposed limitations. Pesticides shall not be permanently stored on public lands authorized for use under this Grant.

- Holder shall conduct all construction, operation, and maintenance activities in a manner that will avoid or minimize degradation of air, land, and water quality. Toxic material shall not be released in any lake or water drainage. All construction work and subsequent use of the right-of-way shall be consistent with applicable federal, state, and local laws and regulations relating to safety, water quality, and public health. Unless otherwise approved in writing by the Authorized Officer, dikes or cofferdams shall be installed to separate concrete work areas from lakes or streams during construction. Mobile ground equipment shall be kept within the right-of-way and out of the waters of lakes, streams or rivers except as permitted by the Authorized Officer.

- It shall be the responsibility of the Holder to comply with the construction practices and mitigating measures established by 33 CFR 323.4 which set forth the parameters of the "nationwide permit" required by Section 404 of the Federal Water Pollution Control Act. If the proposed action exceeds the parameters of the nationwide permit, the Holder shall obtain an "individual permit" from the appropriate office of the Corps of Engineers and provide BLM a copy of that permit prior to commencing actual construction. Failure to comply with this requirement shall be cause for revocation of this right-of-way grant.

- Garbage and other refuse will be stored in containers at all times and disposed of at least once a week in an authorized county-approved sanitary site or landfill. Used engine oil which is changed on federal lands will be stored in suitable containers and delivered to secondary refineries. No fuel, oil, or other hydrocarbon spills are permitted. If such a spill accidentally occurs, the Authorized Officer will be notified immediately and corrective measures undertaken as directed.

- Within 30 days after conclusion of construction and operation, all construction materials, related litter, and debris shall be disposed of in accordance with instructions from the Authorized Officer.

- All reserve and produced water pits will be fenced. Reserve pits will be fenced on three sides during drilling operations. The fourth side will be fenced following release of the drilling rig. All fences will be constructed and maintained in accordance with design standards.

- All rivers, stream, and wash crossings required for access to project facilities will be at existing roads or bridges, except at locations designated by the Authorized Officer. Culverts or bridges will be installed at points where new permanent access roads cross live streams to allow fish unobstructed passage. Where temporary roads cross drainages or dirt fills, culverts will be installed during construction and removed upon completion of the project. Any construction activity in a perennial stream is prohibited unless specifically allowed by the Authorized Officer. All stream channels and washes will be returned to their natural state as quickly as possible. Such construction, when it would occur on National Forest Land, will be managed under the restrictions in the Forest Service and Department of Agriculture Policy Statement No. 2019, dated July 8, 1980. All construction for stream crossings will also follow the Stream Protection section of the Erosion Control, Revegetation, and Restoration Guidelines stipulation.

Roading Guidelines

- Environmental Considerations. Select wildlife habitat, riparian zones, unstable soil areas, threatened and endangered plant locations, side slopes over 40 percent, wetlands, archaeological sites, and watersheds should be avoided when possible during location studies.

- Where large natural drainage systems are encountered, a complete hydrological study of the system must be performed to predict the anticipated runoff.

  As a minimum, culverts shall be designed for a 10-year flood (flow of 10-year recurrence interval) without a head at the entrance. They should also be designed to carry a 50-year flood without exceeding the allowable headwater. The allowable headwater is the maximum water elevation for which the resulting flood damages are considered to be acceptable. Major culverts (end area greater than 35 square feet) and minor bridges (spans on the order of 30 feet or less) should be designed for a 20-year flood and checked for a 50-year flood. All other bridges should be designed to pass a 50-year flood and checked for a 100-year flood.

  The hydrological study shall be included in the road package upon submittal to the FS or BLM for review and concurrence. After the road design is approved, five copies of the plans will be prepared and given to the FS or BLM.

Erosion Control, Revegetation, and Restoration Guidelines

- Where the right-of-way crosses streams and other water bodies, the banks will be stabilized to prevent erosion. Construction techniques will minimize damage to shorelines, recreational areas, and fish and wildlife habitat. A channel stability evaluation will be completed before stream crossing locations are finalized. Channel stability ratings of 1 or 2 shall be avoided.

- Care will be taken to avoid oil spills and other types of pollution in all areas, including streams and other water bodies and in their immediate drainages. All spills will be immediately cleaned up following notification of applicable State and Federal agencies.

- Existing roads will be used for vehicle traffic where possible; vehicles and equipment will not be allowed in streambeds unless specified by the authorizing agency.

- During construction activities in or near streams or lakes, sedimentation (detention) basins and/or straw bale filters will be constructed to prevent suspended sediments from reaching downstream water courses or lakes as required by the Authorizing Officer.

- If construction through extensive wetland areas is deemed necessary, construction will occur during the driest period of the year and/or erosion control mats will be used to minimize erosion damage to wetland sites, as required by the Authorizing Officer.

- Temporary work space areas used at stream and highway crossings and other special sites will be restored to approximate preconstruction conditions and to the satisfaction of the authorizing officials.

- The right-of-way at stream crossings will be restored to preconstruction conditions. The upland areas and banks will be revegetated to preconstruction conditions. Where this is not possible, they will be mulched with rock. The size of the rock mulch will be larger in diameter than materials excavated from the trench. The streambed will be returned to its original contours with sediments like those that were excavated.

- The contour of the ground will be restored to permit normal surface drainage.

- In strongly sloping and steep terrain, erosion control structures such as water bars, diversion channels, and terraces will be constructed to divert water away from the pipeline trench and reduce soil erosion along the right-of-way and other adjoining areas disturbed during construction.

- Pipeline construction activities in narrow floodplain areas subject to high erosion hazards would be timed to avoid high water flows as much as possible, this would reduce the effects of construction on erosion and sedimentation.

Stream Protection

To maintain stream bank stability, preserve stream channel and flood plain effectiveness, and minimize adverse changes in stream water chemistry, physical properties, or associated aquatic organisms, the following will be emphasized:

- The natural drainage channels of any stream will be maintained during construction activities wherever possible.
- Clear water diversion methods will be employed whenever construction activities such as pipeline trenching must pass through a stream channel.
- Tree or shrub vegetation, which give greater stability due to rooting structure, will be replaced during the revegetation of channel banks following construction.
- Construction staging and equipment service areas will be located outside of riparian areas. A buffer strip of terrestrial vegetation will be maintained between the staging and/or service area and the riparian vegetation adjacent to the stream. Riparian vegetation will not be counted upon as a buffer strip because silt collected by the riparian vegetation might enter the stream during high water periods.
- Following construction activities, the stream channel will be returned to as nearly the original width, depth, gradient, and curvature as possible.

GROUNDWATER GEOLOGY - OVERLAY 4

SOURCE

Formations containing aquifers were drawn based on the following USGS maps:

Lines, G. C. and W. R. Glass. 1975. Water resources of the Thrust Belt of western Wyoming. Hydrologic Investigations Atlas HA539. U.S. Geological Survey, Reston, Va.

Welder, G. E. 1968. Ground Water reconnaissance of the Green River Basin Southwestern Wyoming. Hydrologic Investigations Atlas HA-290. U.S. Geological Survey, Washington, D. C.

USE

This overlay was prepared to illustrate the abundant groundwater resources within the well field. Only major aquifers are depicted although many other small aquifers are likely present within the highly irregular faulted and folded geology in the well field. Boundary lines for the aquifers are approximate, they were taken from 1:315,000 scale maps. This overlay in combination with the surface water map presents the various water resources that could be affected by well field development.

STIPULATIONS AND MITIGATION

The primary stipulation for protecting groundwater resources during drilling and production is the NTL requirement that the wells be cased past all freshwater bearing zones of groundwater. Other protective stipulations are outlined under Surface Water. Appendix E-1 in the DEIS discusses potential groundwater monitoring for the Riley Ridge well field.

CLIMATIC ZONES - OVERLAY 5

SOURCE

Climatic zones, defined as areas with similar annual precipitation and growing season, were based on soil survey data, elevations, relief, and available meteorological data. Meteorological data for the entire well field is incomplete and does not reflect the topographic factors (elevation or relief) which contribute to climatic conditions determining appropriate practices for successful revegetation. Climatic zones were determined from unpublished SCS maps, range site descriptions and map unit descriptions (see Soils, Vegetation and Reclamation Technical Report). The boundary lines on the map are general gradations and may not reflect climatic conditions resulting from different aspects (north-facing vs. south-facing slopes). Since the soils information for the well field was compiled from three different soil surveys, each with different levels of detail, the boundaries of each survey are included on this overlay.

USE

The climatic zone overlay along with Overlay 6, Slope, and Overlay 7, Sensitive Rehabilitation Units, should be used together in planning facility locations and selecting techniques and species for revegetation.

STIPULATIONS AND MITIGATION

See measures under Sensitive Rehabilitation Units, Overlay 7.

SLOPE - OVERLAY 6

SOURCE

Slope ranges for most of the well field were delineated based on the slope ranges specified in the map unit descriptions of the BIOWEST and ERT soil surveys. Since the FS soil survey information included broad slope ranges (0-50 percent), slope data available on the VIEWIT computer program was used to supplement the slope phases for the soil survey on National Forest land. Where the boundaries of the three surveys meet, topographic maps and aerial photography were used to "match lines." In some instances, such as on Cretaceous Mountain, steeper slopes than indicated on the slope overlay may occur as inclusions where wide (15-50%) slope categories were delineated.

USE

The slope overlay along with the existing facility overlay should be used together in planning facilities that require extensive cut-and-fill. This is especially important for roads crossing sensitive rehabilitation units (Overlay 7) above perennial streams (Overlay 3).

STIPULATIONS AND MITIGATION MEASURES

Generally, slopes greater than 30 percent should be avoided since they present extremely difficult conditions and require extensive and expensive measures for rehabilitation. Additional measures are included under Sensitive Rehabilitation Units.

SENSITIVE REHABILITATION UNITS - OVERLAY 7

SOURCE

All soils in the well field were grouped into rehabilitation units based on their response to management, use, and similar revegetation techniques. The rehabilitation unit is similar to the SCS Land Capability Classification System. Based on selected criteria that affect revegetation success including slope, % coarse fragment, depth to bedrock, depth of soil, water holding capacity, pH, and erosion hazard, sensitive rehabilitation units were defined for the well field. These sensitive rehabilitation units are depicted on Overlay 7. These soils require special consideration in revegetation planning (Table 5-1). Much of the well field is classified as sensitive, 1,457 acres of planned disturbance would occur in sensitive rehab units, out of a total of 3,968 acres, that would be disturbed by development. Additional detail on sensitive rehabilitation units and appropriate techniques for rehabilitation are discussed in the Soils, Vegetation and Reclamation Technical Report.

USE

This overlay represents a composite of several other resource overlays including climatic zone, slope, vegetation, and soils. As a result, the user is cautioned to consider the data and resolution of this overlay when making revegetation recommendations. In specific cases it is suggested reference be made to the original soils survey data and aerial photography. A site visit may be necessary in order to confirm potential constraints and refine construction and revegetation plans.

STIPULATIONS AND MITIGATION MEASURES

Rehabilitating disturbed lands to their former capabilities and use is a major responsibility and objective of both the FS and BLM. In recent years several measures have been developed to protect and restore disturbed lands. Major categories are listed below along with pertinent excerpts from the DEIS and Technical Report.

TABLE 5-1

SENSITIVE REHABILITATION UNITS DEVELOPED FOR THE RILEY RIDGE STUDY AREA

Rehab.[1] Unit	Soils	Textural Type	Dominant Slope Range[2] (%)	Rooting Depth	Salinity/ Alkalinity	Erosion Hazard	Present Vegetation Type	Rehabilitation Rating	Rehabilitation Considerations	Rehabilitation Suggested Techniques
CLIMATIC ZONE A: COOL, DRY SOUTHERN BASINS. 7-9" PRECIPITATION ZONE, MEAN ANNUAL AIR TEMPERATURE 38-43°F, GROWING SEASON 85-100 DAYS										
*A2	Deep and moderately deep, saline-alkaline soils formed in alluvium on dry drainageways and stream terraces. Includes small areas of geographically associated sand dunes. Corridor Soil Associations 102, 104, 105, 107. Bio/West Units 41, 42, 43.	Loamy to clayey, minor sandy	5-15	20-60"	Severe	Slight, some run-on, severe wind erosion hazard over limited areas	Greasewood, Saltbush, Mixed Desert Shrub	Poor	High salts,[3] compaction, drouthiness	Spring-tooth harrow. Add organic seedbed amendments. Use of salt-tolerant plant species, warm and cool season. Broadcast seeding in late fall. Clean hay mulch crimped in @ 2-4 T/a. Fertilize 2-3 years after seedling establishment.
*A4	Shallow to deep, eroding soils on pediments, truncated uplands, badlands, and escarpments. Corridor Soil Associations 204, 207, 224.	Loamy to clayey	15-50	10-40"	Moderate	Severe	Big sagebrush, Saltbush, Bunchgrass	Poor	Steep slopes, drouthiness, depth to bedrock	Add organic seedbed amendments. Contour furrowing. Closely-spaced water bars. Plant adapted warm and cool-season species via broadcast or drill, depending on access. Clean straw/hay mulch applied @ 2-4 T/a. Mulch tackifiers, erosion control netting.

TABLE 5-1 (CONTINUED)

Rehab.[1] Unit	Soils	Textural Type	Dominant Slope Range[2] (%)	Rooting Depth	Salinity/ Alkalinity	Erosion Hazard	Present Vegetation Type	Rehabilitation Rating	Rehabilitation Considerations	Rehabilitation Suggested Techniques
CLIMATIC ZONE B: COOL, DRY BASINS NORTH AND WEST. 10-14" PRECIPITATION ZONE, MEAN ANNUAL AIR TEMPERATURE 37-40°F, GROWING SEASON 75-90 DAYS										
*B3	Shallow to moderately deep soils on ridgeslopes, hillsides, folded and faulted lands. Corridor Soil Associations 309, 310. Well field Soil Units 84, 86. Includes minor areas of deep soils in Well Field Soil Units 81E, 81F. Bio/West Units 1, 13, 34, 35, 36.	Loamy to clayey	15-30+	10-40"	Moderate	Severe	Big sagebrush, Bunchgrass, some mountain	Poor	Drouthiness, depth to bedrock, high probability of extensive cuts and fills, avoid moist slopes to minimize erosion and slumping	See Rehabilitation Unit A4
CLIMATIC ZONE C: COOL, MOIST FOOTHILLS, 15-19" PRECIPITATION ZONE, MEAN ANNUAL AIR TEMPERATURE 34-37°F, GROWING SEASON 70-85 DAYS										
*C2	Drouthy, shallow and deep, gravelly soils on ridge crests and side-slopes. Well Field Soil Units 50E, 50F, 51E, 51F, 52, 53, 54, 64. ROS Bio/West Units 7, 13, 21.	Loamy, with high rock content	15-30+	10-60"	Moderate	Slight	Bunchgrass, Mountain shrub Douglas fir	Poor	Depth to hard bedrock, stoniness, slope, drouthiness	Seed drought-tolerant species adapted to shallow stony sites. Restore gravelly surface. Broadcast seed, fertilize 2-3 years after seedling establishment.
*C4	Deep, gravelly soils on steep ridgeslopes. Well Field Soil Units 66E, 66F, 77E, 77F, 82, 85, 91. Bio/West Units 12, 20, 22.	Loamy to clayey, with high rock content	15-30+	60"	Moderate	Severe, gullying	Big Sagebrush, Mountain shrub, Aspen	Poor	Slope, stoniness, moist slopes surface erode or slump, need for extensive cuts and fills.	Avoid slump-prone areas. Closely-spaced water bars, other drainage diversions. Mulches, erosion control nets. Broadcast or drill seed according to access. Fertilize 1-2 years after seedling establishment. Transplant containerized shrub seedlings. Use mechanical stabilization techniques such as gabions where necessary.

TABLE 5-1 (CONTINUED)

Rehab.[1] Unit	Soils	Textural Type	Dominant Slope Range[2] (%)	Rooting Depth	Salinity/ Alkalinity	Erosion Hazard	Present Vegetation Type	Rehabilitation Rating	Rehabilitation Considerations	Rehabilitation Suggested Techniques
CLIMATIC ZONE D: COOL, MOIST FOOTHILLS, 20"+ PRECIPITATION ZONE, MEAN ANNUAL AIR TEMPERATURE 32-35°F, GROWING SEASON 60-75 DAYS										
*D4	Deep, well drained gravelly and non-gravelly soils on steep to extremely steep ridges and mountain sideslopes. USFS Units 154D, 220D, 221D, 255D, 360D, 391, 650D, 660D, 675D, 702D, 711D	Loamy to clayey with occ. high rock content	30+	60"	None to slight	Severe	Mixed Pine, Spruce/Sub-alpine fir, Clearcut, Mountain Shrub.	Poor	Steep to extremely steep slopes, shortness of growing season, need for extensive cuts and fills.	Transplant containerized seedlings for trees, shrubs. Broadcast adapted grass species. Use mechanical stabilization and control structures where necessary. Avoid slump-prone areas.
*D5	Deep and shallow, gravelly soils with rock outcrop on steep mountain sideslopes. Well Field Units 55, 93F, 96, 97, 98. Bio/West Unit 10. USFS Units 203D, 355, 492D, 502, 701, 710, 712, 713, 714, 715.	Loamy with high rock content	15-50+	10-60"	Moderate to slight	Severe	Mixed Pine, Spruce/Subalpine fir, Douglas fir, Mountain shrub, Clearcut	Poor	Slope, shortness of growing season, erosion hazard, stoniness, depth to hard bed-rock, need for extensive cuts and fills.	Transplant containerized seedlings for trees, shrubs. See Rehabilitation Unit D4.

Note: See Soils, Vegetation, and Reclamation Technical Report.

[1]Asterisk (*) indicates a sensitive rehabilitation unit.

[2]Slope ranges shown are the dominant slopes; inclusions of flatter or steeper slopes occur within the units. Inclusions of 30 to 50+ percent slopes will require very intensive rehabilitation procedures if disturbed.

[3]Major features defining rehabilitation considerations are underlined.

Committed Mitigation Measures (From DEIS Soils and Vegetation Measures)

- Measure: All new well field pipelines and transmission lines will be required to use common rights-of-way when economically and technically feasible. The exact locations will be determined as necessary by the Authorized Officer.

- Measure: Development will avoid or minimize disturbance to highly saline-alkaline sites and sand dunes. An example of a saline-alkaline site is the "white alkali" Soapholes area north and east of Big Piney. Locations to be avoided would be determined by the Authorized Officer.

- Measure: During transmission line construction, brush (shrub) clearing along access trails and at tower assembly areas will be limited to trimming and/or crushing to avoid disturbing root systems.

- Measure: All areas not needed for production on the well pads must be recontoured and rehabilitated following the drilling phase for each well. The determination on necessary area for operation will be made by the Authorized Officer in consultation with the operator.

Uncommitted Measures

In addition to the mitigation measures described above, several revegetation techniques for different types of facilities as well as revegetation species are recommended in Chapter 3 of the Soils, Vegetation, and Reclamation Technical Report.

Applicants Standard Operating Procedures

- All above-ground facilities, foundations, and salvageable materials would be removed. Soil material would be restored over the well and the site returned to its original contour as soon as the well abandonment was completed. Each completed well site would be reseeded by the next growing season using techniques and methods described in the Erosion Control, Revegetation and Reclamation Program.

- Pipeline Construction. Construction activities would be confined to the construction right-of-way along the length of the gathering lines, trunk lines and sales lines. Only those portions of the right-of-way needed for construction would be cleared of obstacles and debris.

- Blading of the right-of-way would only be done as necessary for access for machinery and equipment, or for the trenching required for the installation of pipe. To further ensure vehicle safety, it may be necessary to construct temporary bridges or culverts

across creeks and gullies on the working side of the right-of-way. Excavation and grading may be necessary to decrease the gradient and increase the stability of unstable slopes, especially in the steep terrain found in the well field. Grading and cut-and-fill excavation would be performed in a manner minimizing effects on natural drainage and slope stability. On steep terrain or in wet areas where the right-of-way must be graded at two elevations, or where diversion dams must be built to facilitate construction, the areas would be stabilized and restored upon completion of construction to resemble their original condition, or as required by the surface management agency or private landowner.

- Generally, ditching operations would employ ditching machines in open areas and backhoes near rivers or in areas providing little working space; however, subsurface conditions may require different types of excavation. In areas where loose or unconsolidated rock is encountered, the ditch line may be ripped mechanically. If material encountered could not be ripped, it would be blasted. Blasting would be kept to a minimum and used only when necessary. An exception to mechanical excavation would be hand-digging to locate buried utilities such as other pipelines and cables.

- Once the ditch has been backfilled, the right-of-way and other disturbed areas would be cleared of trash, brush, and other debris to prevent fire hazards. Some brush would be used to assist in stabilization and rehabilitation of the right-of-way. The right-of-way would be graded where needed, and all disturbed surfaces would be restored approximately to the preconstruction grade.

- Routine aerial reconnaissance flights along pipelines would continue for the life of the projects to check for erosion problems and revegetation success as well as possible gas leaks.

- The right-of-way would be rehabilitated following construction. During the operation phase of the project, the right-of-way would be allowed to revegetate with shrubs; however, trees growing where they could fall across the (sulfur) pipeline would be removed as necessary.

Special Lease Stipulations

Refer to Overlay 2.

Well Field Oil and Gas Operation Measures

- APDs will be valid for a period of one year from the date of approval. If the permit terminates, any surface disturbance created under the APD must be rehabilitated in accordance with the approved plan.

- Final release from liability will be issued by the Authorized Officer when all the provisions of the APD, including incorporation of the Erosion Control, Revegetation and Restoration Guidelines (Appendix B.7 in DEIS) and Surface Owner's Rehabilitation Plan are complete.

General Measures

- During the final survey of the linear facilities (pipelines, transmission lines, etc.), the centerline and outside boundaries of the linear facilities will be staked and flagged. Stakes will be no more than 200 yards apart on open rangelands and a maximum of 100 feet apart on forested lands. Holder/operator name and station numbers of the survey will be written on each stake or hub. Where the linear facilities parallel an existing line, the existing line will be flagged where necessary to avoid disturbance of the existing line. The Authorized Officer reserves the right to make adjustments in right-of-way alignment as may be necessary to minimize environmental impacts.

- The Company shall furnish the Authorized Officer with engineering drawings of the existing ground profile and plan, and profile views of the facilities to be constructed. These drawings must portray typical cross sections (i.e., cut, fill, bench sections, etc.) at representative points along or within the right-of-way.

- At least one year prior to termination or to abandonment of the facilities authorized by this grant, the Holder shall contact the Authorized Officer to arrange a joint inspection of the right-of-way. The inspection will be held to agree on an acceptable abandonment and rehabilitation plan. The Authorized Officer must approve the plan in writing prior to the Holder commencing any abandonment and/or rehabilitation activities. The plan may include removal of drainage structures or surface material; recontouring; replacement of topsoil; seeding, mulching, etc.

- Upon receipt of a certification of construction, when all development and rehabilitation have been completed, a joint compliance check of the right-of-way shall be made by the Company and the Authorized Officer or designated representative to determine compliance with the terms and conditions of the grant. The Company shall perform, at its own expense, any required modifications or additional reclamation work for compliance with the terms of the grant.

- The Company shall conduct all activities directly or indirectly associated with the construction, operation, and maintenance of this facility within the limits of these (rights-of-way, permits). In the event that areas outside of the (rights-of-way, permits) are needed, the Company shall obtain a separate authorization for that use.

- The Holder shall comply with the applicable federal and state laws and regulations concerning the use of pesticides (i.e., insecticides, herbicides, fungicides, rodenticides, and other similar substances) in all activities/operations under this Grant. The Holder shall obtain from the Authorized Officer approval of a written plan prior to the use of such substances. The plan should be submitted no later than December 1 of any calendar year that covers the proposed activities for the next fiscal year (i.e., December 1, 1983, deadline for a fiscal year 1985 action). If need for emergency use of pesticides is identified, the use must be approved by the Authorized Officer. The use of substances on or near the right-of-way shall be in accordance with the approved plan. A pesticide shall not be used if the Secretary of the Interior has prohibited its use. A pesticide shall be used only in accordance with its registered uses and within other limitations if the Secretary has imposed limitations. Pesticides shall not be permanently stored on public lands authorized for use under this Grant.

- The Company shall construct, operate, and maintain the facilities and structures within these (grants, permits) in strict conformity with the descriptive and technical data which was furnished the BLM or the FS in connection with the application for these (grants, permits). Any relocation, additional construction, or use which is not in accord with such data may not be initiated without the prior written approval of the Authorized Officer. A copy of the complete application and a copy of the (grant, permit) stipulations shall be available on location during construction and rehabilitation to all supervisory personnel and to the Authorized Officer. Noncompliance with the above will be grounds for the Authorized Officer to shut down the operation until compliance is obtained.

- The Company shall schedule and attend a preconstruction conference with the Authorized Officer and his representative prior to commencing any construction activities on these (rights-of-way, permits). The Company or his representative and all of his contractors or agents involved with construction under these (rights-of-way, permits) shall attend this conference. The Company shall contact the Authorized Officer or his representative at least 10 working days (2 weeks) prior to the anticipated start of construction to schedule this conference.

- The requirements within the Erosion Control, Revegetation, and Reclamation Guidelines and FS-BLM Roading Guidelines for Oil and Gas Development will be followed in the development of the CU Plans and in developing procedures for the APDs.

- Holder shall conduct all construction, operation, and maintenance activities in a manner that will avoid or minimize degradation of air, land, and water quality. Toxic material shall not be released in any lake or water drainage. All construction work and subsequent use of the right-of-way shall be consistent with applicable federal, state, and local laws and regulations relating

to safety, water quality, and public health. Unless otherwise approved in writing by the Authorized Officer, dikes or cofferdams shall be installed to separate concrete work areas from lakes or streams during construction. Mobile ground equipment shall be kept within the right-of-way and out of the waters of lakes, streams or rivers except as permitted by the Authorized Officer.

- Garbage and other refuse will be stored in containers at all times and disposed of at least once a week in authorized county-approved sanitary site or landfill. Used engine oil which is changed on federal lands will be stored in suitable containers and delivered to secondary refineries. No fuel, oil, or other hydrocarbon spills are permitted. If such a spill accidentally occurs, the Authorized Officer will be notified immediately and corrective measures undertaken as directed.

- The riparian zone of stream crossings shall be rehabilitated immediately after construction is completed. Until riparian vegetation is established, the disturbed area shall be protected on each side of the stream to prevent sediment contamination of the stream and/or erosion of the banks.

- A buffer strip of terrestrial vegetation will be left between staging areas and riparian vegetation adjacent to the stream. Riparian vegetation will not be counted upon as a buffer strip because silt collected by the riparian vegetation might enter the stream during high water periods.

- Areas subject to mudflows, landslides, mudslides, avalanches, rock falls, and other types of mass movement will be avoided where practical when locating linear facilities. Where avoidance is not practical, the design, based upon detailed field investigations and analyses, will provide measures to prevent the occurrence of mass movements.

- Watering or other approved dust abatement procedures will be done to prevent severe wind erosion and loss of soil materials during construction.

- In compliance with the CU Plan, the Company will reclaim the surface of disturbed areas to conform with adjacent terrain by replacing fills in the original cuts, replacing soil material, water barring, and revegetating the surface.

- In right-of-way or permit clearing in timbered areas, all tree stumps will be cut as low as practical, but not higher than 14 inches. The trees will be limbed and stacked adjacent to the right-of-way. During cleanup, all clearing and grubbing debris (slash), excluding stumps and useable products will be piled for burning or buried as specified by the Authorized Officer.

- Preclearing of mountain brush and tree-covered areas prior to dozer and maintenance blade work will be required. Preclearing will involve hand cutting brush and trees and removing them to designated areas.

- The clearing of timber, to reduce fire hazard, will be limited to the right-of-way.

- Right-of-way clearing in timbered, dense shrub, and scenic areas shall be done in accordance with the approved clearing plan and shall be limited to a minimum width necessary to prevent interference of trees and other vegetation with the facility construction. Authorized Officer may require clearing to be "feathered or graded" with curved or undulating boundaries to lessen visual "tunnel" effect. In locations where the right-of-way enters timber, including dense shrub, from meadows or other open areas, the Authorized Officer may require clearing to be "feathered" into the timber in order to retain maximum natural vegetative patterns. Authorized Officer may require a landscape architect to assist in the design of the clearing plan. Right-of-way clearing in canyons spanned by power lines will be limited to that required to build the line and maintain clearance with the conductor. Trees and shrubs will be cleared by hand on fragile steep slopes and rock areas as identified by the Authorized Officer prior to construction. <u>If any merchantable timber is involved in right-of-way clearing, it must be harvested in accordance with the terms of the BLM/FS timber sale contract</u>.

- A transportation plan will be submitted as part of the CU Plan. This plan will cover approval of temporary, reconstructed, and newly constructed roads and will include clearing work, signing, rehabilitation, and uses associated with transportation needs. Overland access could be specified in lieu of road construction or reconstruction.

  Whenever practical "cross country" access will be utilized without clearing vegetation or grading a roadbed. All construction and vehicular traffic is to be confined to the right-of-way or designated access routes, roads, or trails unless otherwise authorized. All temporary work roads to be used for construction will be rehabilitated after construction in accordance with the approved rehabilitation plan. Only one road or access route will be permitted to each site requiring access. Any existing transportation or utility rights-of-way will be used wherever practicable to minimize adverse environmental impacts and the proliferation of separate rights-of-way.

<u>Roading Guidelines</u>

- Environmental Considerations. Select wildlife habitat, riparian zones, unstable soil areas, threatened and endangered plant locations, side slopes over 40 percent, wetlands, archaeological sites, and watershed areas should be avoided when possible during location studes.

- Geotechnical Considerations. Unstable areas, potentially unstable areas, and areas showing evidence of high moisture or free water should be identified and avoided. Soil classification samples

should be collected and processed during this period for future road surfacing determinations. Aggregate sources should be identified, tested, and mapped. Roadway excavation areas should be tested to determine the steepest stable cut slopes that could be constructed.

- All obliterated areas shall be revegetated by applying seed and fertilizer mixture approved by the FS or BLM.

- Geometric Considerations. The geometric standards for each particular road must be considered during location.

Erosion Control Revegetation and Restoration Guidelines

The guidelines included in Appendix A of this report specifically address rehabilitation requirements for disturbance on federal lands. They are also included in Chapter 3 of the Soils, Vegetation, and Reclamation Technical Report, and Appendix B.7 of the DEIS.

VEGETATION - OVERLAY 8

SOURCE

The vegetation overlay was prepared from aerial photography including USGS and ASCS 1:24,000 black and white ortho-photo quads and BLM and FS true color photography at 1:15,840 scale. Vegetation community types were classified using the criteria outlined in Table 5-2. Types were delineated on 1:24,000 base maps down to a resolution of 40 acres.

USE

This overlay, in combination with the sensitive rehabilitation units overlay and slope overlay, should be used in selecting species for revegetation planning. This overlay should also be used in delineating wildlife habitat and agricultural lands.

STIPULATIONS AND MITIGATION

No known populations of federally listed threatened or endangered plant species occur in the well field; therefore, no specific mitigation has been developed for threatened and endangered species. Some rare species of interest to the State of Wyoming may occur in the well field (see Soils, Vegetation, and Revegetation Technical Report). Other measures designed to

TABLE 5-2

VEGETATION MAP UNITS & MAPPING CRITERIA FOR WELL FIELD AND CORRIDORS, RILEY RIDGE EIS STUDY AREA

Vegetation Types	Source of Vegetation Type Name	Photointerpretation Criteria (true color aerial photography @1:15,000)	Composition Criteria	Comments
Mixed Pine	Bridger-Teton NF Timber Stand map legend	Lodgepole-small diameter crown, round top, commonly occurs in dense, even-aged stands on steep, north aspects. Whitebark pine-wide, irregular crown shape, found primarily in open stands on ridges. Limber pine-minor constituent no criteria	>50% of total canopy cover consists of lodgepole, timber or whitebark pine. Criteria source: USFS Bridger-Teton Timber Stratification Guideline	Lodgepole contributes the majority (75%) of the pine cover in this type on well field. Many stands contain juvenile and mature subalpine fir.
Spruce-fir	Bridger-Teton NF Timber Stand map legend	Subalpine fir - small diameter crown, spire top, commonly in stands of mixed ages on steep, north aspects at higher elevations. Englemann spruce - minor constituent, no criteria.	>50% of total canopy cover consists of Subalpine fir or Engelmann spruce. Criteria source: see Mixed Pine	Subalpine fir is the most important species within this type in the project area; intergrades extensively with Mixed Pine type at higher elevations on well field.
Douglas-fir	Bridger-Teton NF Timber Stand map legend, BLM URA map legend	Large diameter crown, commonly in open to fairly dense stands at lower elevations (7500'-8500') on north facing slopes	>50% of total canopy cover consists of Douglas fir. Criteria Source: see Mixed Pine	Intergrades with Mixed Pine type at lower elevations on north and south aspects on well field.
Aspen	Bridger-Teton NF Timber Stand map legend BLM URA map legend	Deciduous crown, clonal growth pattern (patchy), commonly as even-aged stands on deeper soils on all aspects, slopes at middle elevations (8500-9000')	>50% of total canopy cover consists of aspen. Criteria source: see Mixed Pine	Stands frequently contain conifer saplings (subalpine fir, Englemann spruce) on well field.
Cottonwood	ERT	Large trees, broad crowns, low density. Located on floodplains of major streams and rivers	Cottonwood trees present	Occurs primarily along Green River and low elevations of S. Piney Creek.
Bunchgrass-forb	BLM URA-(Grassland)	Smooth, often gray texture. Occupies windswept ridges with very shallow soils. Contains some inclusions of big, low, and black sagebrush.	>75% of total canopy cover consists of grasses and forbs. Dominants include bluebunch wheatgrass, king's fescue, Hood phlox, hymenoxys, fringed sagewort. Criteria Source: ERT	Composition ranges from cushion-forb communities on ridgeline to bunch grass dominated communities on wind-protected slopes on well field. Grass component more important at higher elevations (e.g., Darby Mt.).
Big Sagebrush	BLM URA map legend	Dark gray texture, high density. Occupies drainage bottoms, deeper soils on ridgetops, basins, and side slopes. At higher elevations (8500'-9500') green color of other shrub species associated with big sagebrush can be seen.	>50% of total canopy cover consists of big sagebrush. Inclusions include low sagebrush and black sagebrush, bunch grass. Criteria Source: ERT	At higher elevations (>7500') principally Artemisia tridentata ssp. vaseyana; at lower elevations (>7500') principally Artemisia tridentata ssp. wyomingensis. Occurs on well field and transportation corridors.

TABLE 5-2 (CONTINUED)

Vegetation Types	Source of Vegetation Type Name	Photointerpretation Criteria (true color aerial photography @1:15,000)	Composition Criteria	Comments
Sagebrush Complex	ERT	Mosaic consisting of small patches of big sagebrush (dark gray, heterogeneous in height) and low and black sagebrush (light gray, uniform height, low density).	>50% of total canopy cover consists of low or black sagebrush; big sagebrush present. Criteria Source: ERT	Unit predominates on shallow soils. Black sagebrush usually intermingled with low sagebrush; big sagebrush forming small, discrete patches. Occurs primarily on well field.
Mountain Shrub	BLM URA legend	Greenish to brownish, variable canopy height	Mountain mahogany; snowberry, serviceberry and ceanothus potentially present; big, low or black sagebrush <50% of total canopy cover. Criteria Source: ERT	Occurs on steep slopes, usually on the lee side of ridges on well field.
Willow	ERT	Dark green, globular shrubs in riparian zone; forming patches, often associated with beaver activity	>50% of total canopy cover consists of willow shrubs. Herbaceous species (grasses, rushes, sedges) important constituents. Criteria Source: ERT	Located on floodplains of principal streams on well field.
Greasewood	BLM URA map legend	Light green, discernible crown, scattered; often mixed with sagebrush species	>50% of total canopy cover consists of greasewood. Criteria source: ERT	Located in wide drainageways and basins at lower (7000'-7500') elevations on well field.
Low Saltbush	ERT	Gray green, very low density, usually on basin floors, often on alkaline (whitish) soils	>50% of total canopy cover consists of low saltbush species (Nuttall saltbush, mat saltbush) Criteria Source: ERT	Occurs primarily on transportation corridors.
Shadscale	BLM URA map legend	Gray green, very low density, usually on side slopes on alkaline (whitish or reddish) soils.	>50% of total canopy cover consists of shadscale saltbush. Criteria Source: ERT	Occurs primarily on transportation corridors along margins of basins and major drainages.
Riparian Meadow	ERT	Green, herbaceous species with few or no shrubs; restricted to riparian zone; no evidence of human manipulation (e.g., diversion ditches, haystacks).	<50% of total canopy cover consists of willow shrubs; herbaceous species (grass, rushes, sedges) primary constituents. Criteria Source: ERT	Located on floodplain of major and minor streams on well field and at major stream crossings on transportation corridors.
Pasture/Hayfield	ERT	Green, herbaceous species with few or no shrubs; primarily located in riparian zone; evidence of human manipulation (e.g., diversion ditches, haystacks, farm machinery)	<50% of total canopy cover consists of willow shrubs; herbaceous species (grasses, rushes, sedges) primary constituents. Criteria Source: ERT	--
Forest clearcut	ERT	Open area surrounded by closed forest; slash piles evident, access roads to sites.	No mature trees present	Understory consists of a variety of herbaceous species, scattered shrubs, conifer saplings.

maintain vegetation productivity capabilities are included under Sensitive Rehabilitation Units. Measures for protecting riparian areas are included under Wildlife Overlay 12. Measures to protect agricultural lands and timber are summarized below.

Committed Mitigation Measures

See Sensitive Rehabilitation Units Overlay 7 for required measures to protect vegetation.

Uncommitted Mitigation Measures

- The companies could work with the federal land management agencies and WGF to develop an Environmental Awareness Program to provide positive reinforcement of constructive public attitudes and actions toward preserving and protecting the environment. For timber this program could include information on opportunities and regulations pertaining to fuel wood, posts and poles, and Christmas trees.

- The companies could discourage off-road vehicle use during non-working hours through employee educational programs. The federal off-road regulations would be provided to the employees through such programs.

Applicants Standard Operating Procedures

- If blasting is necessary, fire protection measures would be implemented.

Well Field Oil and Gas Operating Measures

See Sensitive Rehabilitation Units Overlay 7.

General Measures

- The Company shall, at all times during construction, maintenance, and operation, maintain satisfactory spark arrestors on all steam and internal combustion engines and on all flues used in operations under this grant.

- The Holder shall comply with the applicable federal and state laws and regulations concerning the use of pesticides (i.e., insecticides, herbicides, fungicides, rodenticides, and other similar substances) in all activities/operations under this Grant. The Holder shall obtain from the Authorized Officer approval of a written plan prior to the use of such substances. The plan should be submitted no later than December 1 of any calendar year that covers the proposed activities for the next fiscal year (i.e., December 1 1983, deadline for a fiscal year 1985 action). If need for emergency use of pesticides is identified, the use must be

approved by the Authorized Officer. The use of substances on or near the right-of-way shall be in accordance with the approved plan. A pesticide shall not be used if the Secretary of the Interior has prohibited its use. A pesticide shall be used only in accordance with its registered uses and within other limitations if the Secretary has imposed limitations. Pesticides shall not be permanently stored on public lands authorized for use under this Grant.

- The requirements within the Erosion Control, Revegetation, and Reclamation Guidelines and FS-BLM Roading Guidelines for Oil and Gas Development will be followed in the development of the CU Plan and in developing procedures for the APDs.

- The Company shall perform all work with explosives and flammable materials in such a manner as not to endanger life or property. All storage places for explosives and flammable material shall be marked "DANGEROUS". The method of storing and handling explosives and flammable materials shall conform to recommended procedures contained in the "Blasters Handbook" published by E. I. de Pont de Nemours and Company, and in all federal, state, and local laws and regulations.

- The riparian zone of stream crossings shall be rehabilitated immediately after construction is completed. Until riparian vegetation is established, the disturbed area shall be protected on each side of the stream to prevent sediment contamination of the stream and/or erosion of the banks.

- A buffer strip of terrestrial vegetation will be left between staging areas and riparian vegetation adjacent to the stream. Riparian vegetation will not be counted upon as a buffer strip because silt collected by the riparian vegetation might enter the stream during high water periods.

- In right-of-way or permit clearing in timbered areas, all tree stumps will be cut as low as practical, but not higher than 14 inches. The trees will be limbed and stacked adjacent to the right-of-way. During cleanup, all clearing and grubbing debris (slash), excluding stumps and useable products will be piled for burning or buried as specified by the Authorized Officer.

- Preclearing of mountain brush and tree-covered areas prior to dozer and maintenance blade work will be required. Preclearing will involve hand cutting brush and trees and removing them to designated areas.

- The clearing of timber, to reduce fire hazard, will be limited to the right-of-way.

- Right-of-way clearing in timbered, dense shrub, and scenic areas shall be done in accordance with the approved clearing plan and shall be limited to a minimum width necessary to prevent interference of trees and other vegetation with the facility

construction. Authorized Officer may require clearing to be "feathered or graded" with curved or undulating boundaries to lessen visual "tunnel" effect. In locations where the right-of-way enters timber, including dense shrub, from meadows or other open areas, the Authorized Officer may require clearing to be "feathered" into the timber in order to retain maximum natural vegetative patterns. Authorized Officer may require a landscape architect to assist in the design of the clearing plan. Right-of-way clearing in canyons spanned by power lines will be limited to that required to build the line and maintain clearance with the conductor. Trees and shrubs will be cleared by hand on fragile steep slopes and rock areas as identified by the Authorized Officer prior to construction. If any merchantable timber is involved in right-of-way clearing, it must be harvested in accordance with the terms of the BLM/FS timber sale contract.

Roading Guidelines

See measures listed under Sensitive Rehabilitation Units, Overlay 7.

Erosion Control, Revegetation, and Restoration Guidelines

See measures listed under Rehabilitation Units, Overlay 7.

WILDLIFE ELK-OVERLAY 9

SOURCE

This overlay was prepared based on Wyoming Game and Fish Department Herd Unit Mapping, 1982. The information was compiled and mapped by Wyoming Game and Fish biologists over past years based on personal judgement, observations, and field surveys. The maps were originally drawn at 1:126,720 scale and then redrawn at 1:48,000; therefore, boundary lines are approximated. Animal distribution may change over time.

USE

This overlay, along with the facility overlay (1) and special stipulations overlay (2), should be used in specifying timing constraints or other protective measures to minimize impacts to wintering and calving elk. Specific periods of avoidance, as well as access and activities should be coordinated with local Wyoming Game and Fish biologists. Several timing constraints are already in effect on some leases, see Overlay 2.

STIPULATIONS AND MITIGATION

Committed Mitigation Measures

- Measure: State wildlife laws and regulations will be posted in conspicuous places at the job sites and work camps.

- Measure: During construction and operation phases, dogs, excepting guard dogs or seeing-eye dogs, will be prohibited from well sites and construction sites.

- Measure: The location of the well in the Graphite Unit, Sec. 22, T27N, R114W will be relocated and approved by the Authorized Officer. Offset drilling or other measures may be required at the time of approval.

- Measure: Where the Authorized Officer determines that rehabilitation of temporarily disturbed areas within critical wildlife habitat on federal land will not be successful within five years from disturbance, the company will be required to compensate for the lost habitat. Temporarily disturbed areas do not include those covered by permanent facilities like road beds, well site equipment, etc. Such critical wildlife habitat will be determined by the Authorized Officer in conjunction with Wyoming Game and Fish. Compensation will include continued rehabilitation efforts on the disturbed areas and development and implementation of an off-site mitigation plan for similar critical habitat on federal land within the species use area that is in poor condition due to natural or man-made causes. The plan must be approved by the Authorized Officer who will coordinate with Wyoming Game and Fish.

- Measure: Colored markers will be hung on transmission lines to increase visibility of wires over river crossings within known bald eagle concentration areas in order to reduce eagle and sandhill/whooping crane collisions with wires.

- Measure: The critical ranges and other important wildlife areas will be avoided during the periods listed below during construction of linear facilities unless direction is otherwise given from the Authorized Officer. (See Wildlife Overlays 9, 10, 11, and 12).

Area	Period
Elk critical winter range	Nov. 15 to April 1
Deer critical winter range	Nov. 15 to April 1
Sage grouse leks	March 1 to June 30
Golden eagle nests (within 1 mile)	February 1 to July 15
Osprey nests (within ½ mile)	April 15 to August 15
Prairie falcon nests (within ½ mile)	March 15 to August 1
Merlin nests (within ½ mile)	April 15 to August 15
Ferruginous hawk nests (within ½ mile)	March 15 to July 15
Cooper's hawk nests (within ½ mile)	April 1 to August 15
Burrowing owl nests (within ½ mile)	April 15 to July 15
Swainson's hawk nests (within ½ mile)	April 1 to July 15

- Measure: Staging areas for stream crossing equipment will be located outside of the stream's riparian zone in order to reduce the possibility of silt entering into streams and to reduce disturbance to vegetation in the riparian zone. A maximum construction right-of-way of 25 feet would be used in riparian areas to reduce disturbance. Variances to this must be approved by the Authorized Officer.

- Measure: Well pads and all other facilities, currently and in the future, planned for the riparian zone shall be offset from the stream bank and/or out of alluvial soils or soils with poor drainage as approved by the Authorized Officer. The distance should be at least 500 feet wherever topographically possible.

- Measure: Crossings of the Green River will be conducted during the fall low flow period. Major crossings for the sales gas, sour gas, molten sulfur, and CO_2 lines will be placed at islands if such are identified within 1 mile of the centerline as identified in the Construction and Use Plan.

- Measure: The intake structure on the Green River for the proposed Craven Creek water supply pipeline (and any others) will be constructed in accordance with design specifications provided or approved by Wyoming Game and Fish.

- Measure: The companies will be required to develop and implement a sediment monitoring plan to be approved by the Authorized Officer.

- Measure: In the event an applicant finds it necessary to remove a beaver pond which has flooded an existing road, the applicant will initiate consultation with WGF and BLM or the FS.

Uncommitted Mitigation Measures

- The companies could work with the federal land managing agencies and WGF to develop a Environmental Awareness Program to provide positive reinforcement of constructive public attitudes and actions toward preserving and protecting the environment. The companies with Riley Ridge activities could jointly fund such a program. This program could include establishment of local conservation clubs, involvement of employees and their families in conservation projects and programs, and annual awards to conservation minded staff or to those who report problems related to management of the environment.

- Speeds along well field access roads could be limited to 25 mph unless otherwise indicated. Speed limit signs could be posted as appropriate. If speed limits are abused, speed bumps could be installed.

- During peak years of project construction from 1984 to 1990, the companies could jointly finance two additional temporary WGF game wardens for the local region. After construction declines and local populations decrease, one permanent warden could be funded for the life of the project or as determined necessary by WGF.

- The companies and their contractors could consider conviction of a job-related game violation as grounds for dismissal.

- The companies could discourage off-road vehicle use during non-working hours through employee educational programs. The Federal off-road regulations would be provided to the employees through such programs.

- Guns could be prohibited on all job sites.

- Companies could contribute funds to land managing agencies to augment maintenance of developed and dispersed recreational areas.

- Companies could develop an anti-vandalism program for personnel with regards to existing range improvements and other structures on federal lands, and could ensure disciplinary action in the event such vandalism were to occur.

- To reduce vehicle/animal collisions, as well as general disturbance, dust, and high traffic volumes, comprehensive ride sharing programs could be implemented by the companies. These would include use of buses, van pools, and car pools to transport workers to construction sites.

- The companies could schedule the construction work shifts so that peak arrival and departure time are not coincident with peak recreational travel.

- Mitigation measures dealing with an increased regional population could include limiting the number of hunting licenses, modification of length of season, imposition of bag limits, limited quota hunting, stocking of local streams, increased numbers and use of game wardens, or stricter enforcement of existing regulations. These measures, if implemented, would control, but not eliminate, the significant recreation impacts.

Applicants Standard Operating Procedures

No specific measures for wildlife.

Special Lease Stipulations

See Overlay 2.

Well Field Oil and Gas Operating Measures

No specific measures for wildlife.

General Measures

(See General Measures listed under Overlay 12).

- All reserve and produced water pits will be fenced. Reserve pits will be fenced on three sides during drilling operations. The fourth side will be fenced following release of the drilling rig. All fences will be constructed and maintained in accordance with design standards appended to each permit by the Authorized Officer.

- The Company will be required to control off-road vehicular use within these (rights-of-way, permits).

- If a natural barrier used for livestock control is broken during construction, the holder will adequately fence the area to prevent drift of livestock. In pronghorn antelope ranges, the fence may have to be constructed in a manner which allows for animal passage. All fencing by the Company will meet FS and BLM design requirements with input from Wyoming Game and Fish Department. Fence specifications will be determined on a case-by-case basis.

- During construction the Company shall regulate access and vehicular traffic as required to protect the public, wildlife, and livestock from hazards associated with the project. The Company shall permit free and unrestricted public access to and upon the (right-of-way, permit) except in areas designated as restricted by the Holder or Authorizing Officer. All restricted areas shall be approved in writing by the Authorized Officer.

Roading Guidelines

No specific measures for wildife.

Erosion Control, Revegetation, and Restoration Guidelines

None specific to wildlife, see measures listed under Overlay 7.

WILDLIFE-MOOSE-OVERLAY 10

(Refer to Elk-Overlay 9)

WILDLIFE-MULE DEER/BIGHORN SHEEP - OVERLAY 11

(Refer to Elk-Overlay 9 and Surface Occupancy Stipulations-Overlay 2)

WILDLIFE-OTHER SPECIES-OVERLAY 12

SOURCE

Historical sage grouse distribution information was obtained from Wyoming Game and Fish Department Biologist, Bruce Johnson of Big Piney, Wyoming. Active sage grouse strutting ground locations are based on a May 1983 ERT aerial survey. Raptor nests and prairie dog towns (potential black-footed ferret habitat) were mapped from BLM Pinedale Unit Resource Area data (URA) field observations, miscellaneous reports, and a 1982 ERT survey. Colorado River cutthroat trout streams were mapped from WGF records.

USE

This overlay, along with the vegetation (8) and facility overlay (1) can be used to identify resource conflicts. The historical sage grouse strutting grounds were mapped in the late 1950s and may no longer be active. No activity on these leks was observed in May 1983. Additional raptors nests probably occur within the well field.

STIPULATIONS AND MITIGATION MEASURES

Committed Mitigation Measures

See measures listed under Overlay 9.

> Measure: Fisheries and Surface Water Quality Monitoring will be conducted for the well field. The approved plan is included in Appendix C.

Uncommitted Mitigation Measures

See measures listed under Overlay 9.

Applicants Standard Operating Procedures

No specific measures for wildlife.

Special Lease Stipulations

See Overlay 2.

Well Field Oil and Gas Operating Measures

No specific measures for wildlife.

General Measures

- Under the terms of the Endangered Species Act of 1973, the Company will conduct surveys, no more than one year prior to disturbance, to determine if listed species or their habitats might be present on areas to be disturbed by any of the proposed action, or alternatives, regardless of land ownership. If it is determined that listed species or their habitats might be present and could be affected by the proposals, appropriate consultations with the U.S. Fish and Wildlife Service will be conducted by the federal authorizing agency. No activities will be authorized until consultation is complete as specified by Section 7(c) of the consultation process which would specify the mitigation measures to be carried out. The Biological Opinion issued by the Fish and Wildlife Service as a result of the consultation process will specify the mitigation measures to be carried out by the Company.

  The Holder shall develop a conservation plan consistent with the FWS Biological Opinion that will ensure the continued existence of threatened or endangered species is not jeopardized or that their critical habitat is not destroyed or adversely modified.

- Any active golden eagle nest found within 1 mile of the project activities will be protected from harassment during the critical nesting period because of provisons established by the Bald Eagle Protection Act which requires protection of the golden eagle and its nests.

- For transmission or powerlines, the Company shall meet all requirements contained in Suggested Practices for Raptor Protection on Powelines. Prior to construction, the Company shall provide the Authorized Officer with drawings which show phase spacings, configuations, and grounding practices for this power distribution line. The Company shall modify any structures not in conformace with Suggested Practices for Raptor Protection on Powerlines as determined by the Authorized Officer.

Roading Guidelines

No specific measures for wildlife.

Erosion Control, Revegetation, and Restoration Guidelines

No specific measures for wildlife, see Overlay 7.

Possible Mitigation Considerations

In designing culverts, the potential for increased erosion related to increased water velocities should be considered. Where increased velocities may cause channel degradation, or form barriers to juvenile fish some form of energy dissipater should be considered. For example, "head-cutting" could be reduced or prevented by using spill pools with a gabion sill.

In the past, stream habitat degradation has resulted from poor operational maintenance of reserve pits. Reserve pits' liquid waste should be pumped and removed from reserve pits before winter. This would help ensure pits would not overflow from snow melt or surface runoff.

Pipeline stream crossings should be backfilled with similar size material, especially in critical spawning reaches.

Disturbed riparian areas may need to be fenced during the early rehabilitation period to ensure livestock do not prevent bank cover from becoming established.

CHAPTER 6

HUMAN RESOURCES OVERLAYS

Six overlays depicting land ownership, recreational areas, H_2S receptors, cultural resources, and visual resources were prepared for the sensitivity analysis system. All information, with the exception of visual resources, represents existing information. The visual resources overlays illustrating management classification, visibility, and landscape were designed as part of the Visual Resources statement of work supporting the DEIS. A special "sensitivity analysis" was done for visual resources and is discussed in detail in Appendix C.2 of the DEIS and the Visual Resources Technical Memorandum prepared by EDAW, Inc.

LAND OWNERSHIP-OVERLAY 13

SOURCE

Land ownership is based on the Bridger-Teton National Forest Map and BLM land status maps.

USE

Land ownership can be used to identify the Authorizing Agency approving development activities.

STIPULATIONS AND MITIGATION

No land use conflicts were identified in the Riley Ridge well field; therefore, no specific measures have been developed. The well field lies adjacent to the Rock Creek ACEC (Area of Critical Environmental Concern within the Lake Mountain Wilderness Study Area) depicted on Overlay 14. Special surface occupancy stipulations are in affect for contingent areas. General stipulations which generally apply to land use (including agriculture and grazing) are described below.

Committed Mitigation Measures

- Measure: Construction will be scheduled during the months of April, May, and October to avoid conflicts with trailing sheep herds on the Slate Creek Sheep Trail. Timing will be determined by the Authorized Officer.

Uncommitted Mitigation Measures

None specific to land use were developed.

Applicants Standard Operating Procedures

- Where fences are encountered along the right-of-way, adequate bracing would be installed at each edge of the right-of-way prior to cutting the wires and installing temporary gates. The opening would subsequently be controlled as necessary during construction. No gates or cattleguards on established roads over public land would be locked, blocked, or closed by the applicants. Any cattleguard damaged would be repaired to its original condition or replaced. If a natural barrier used for livestock control were damaged during construction, the applicant would adequately fence the area to prevent the escape of livestock.

- The depth of the pipeline ditch would vary with the conditions encountered. The cover from the top of the pipe to the ground level would generally be 2.5 to 5 feet. However, in areas where rocks would be removed by blasting, the cover would be 24 inches in populated areas and 18 inches in open country. At railroad and road crossings, specifications require a minimum of 3 feet of cover over the pipe at the drainage ditches along the roadbed. Working areas of approximately 100 by 350 feet would be needed on each side of road and railroad crossings.

- When crossing canals or irrigation ditches that are dredged to maintain depth, the pipeline would either span overhead or be buried underneath to a depth that would permit safe dredging operations.

- If blasting is necessary, the following safety precautions would be adhered to:

  1) In areas of human use, shots would be blanketed (matted).

  2) Landowners or tenants in proximity to the shot would be notified in advance so that livestock and other property could be adequately protected.

  3) Before detonation, a clearance would be made to ensure that construction personnel and equipment and local residents are in no danger.

  4) Fire protection measures would be implemented.

Special Lease Stipulations

Refer to Overlay 2.

Well Field Oil and Gas Operating Measures

None specific to land use have been developed.

General Measures

- Permittees and other regular users of public lands affected by construction of the projects will be notified in advance of any construction activity that may affect their businesses or operations. This will include, but not be limited to, signing of temporary road closures, and notification of proposed removal and/or cutting of fences, and disturbances to range improvements or other use-related structures.

- The power transmission and distribution lines shall be designed and constructed in accordance with accepted standards and specifications for power transmission lines of similar voltage, capacity, and purpose. The Company shall place and maintain suitable structures and devices to reduce to a reasonable degree, the liability of contact between its power transmission line and telegraph, telephone, signal, or other power transmission lines heretofore constructed and shall also place and maintain suitable structures and devices to reduce to a reasonable degree, the liability of any structures or wires falling or obstructing traffic or endangering life on highways or roads.

- Natural phenomena which occur on government land, such as avalanches, rising waters, high winds, falling limbs or trees, and other hazards, present risks to the Company's property which the Company assumes. The Company has the responsibility of inspecting the site, right-of-way, and immediate adjoining area for dangerous trees, hanging limbs, and other evidence of hazardous conditions and, after securing permission from the FS or BLM, of removing such hazards in order to protect the Company's improvements.

- These (rights-of-way, permits) do not convey access across private, patented, state or fee lands. These (rights-of-way, permits) are issued on the condition that the Company has secured or will secure the necessary additional rights-of-way. The Company shall be required to show that they have secured consent for access across private, patented, state, or fee land prior to BLM-FS granting rights-of-way or permits.

- No signs or advertising devices shall be erected on the area designated by this permit or highways leading thereto, without prior approval by the FS or BLM as to location, design, size, color, and message. Erected signs shall meet standards provided by the Authorized Officer and be maintained or renewed as necessary.

- The Company shall protect all survey monuments, witness corners, reference monuments, and bearing trees within these (rights-of-way, permits) against disturbance during construction, operation, maintenance, and rehabilitation. If any monuments, corners, or accessories are destroyed, obliterated, or damaged during construction, operation, or maintenance, Holder shall secure the services of a Registered Land Surveyor to restore the disturbed monuments, corners, or accessories, at the same location, using surveying procedures found in the Manual of Surveying Instructions for the Survey of the Public Lands of the United States, latest edition. Holder shall record such survey in the appropriate county and shall send a copy to the Wyoming State BLM Office, P.O. Box 1828, Cheyenne, Wyoming 82001.

- If a natural barrier used for livestock control is broken during construction, the holder will adequately fence the area to prevent drift of livestock. In pronghorn antelope ranges, the fence may have to be constructed in a manner which allows for animal passage. All fencing constructed by the Company will meet FS and BLM design requirements with input from Wyoming Game and Fish Department. Fence specifications will be determined on a case-by-case basis.

- A transportation plan will be submitted as part of the CU Plan. This plan will cover approval of temporary, reconstructed, and newly constructed roads and will include clearing work, signing, rehabilitation, and uses associated wih transportation needs. Overland access could be specified in lieu of road construction or reconstruction.

  Whenever practical "cross country" access will be utilized without clearing vegetation or grading a roadbed. All construction and vehicular traffic is to be confined to the right-of-way or designated access routes, roads, or trails unless otherwise authorized. All temporary work roads to be used for construction will be rehabilitated after construction in accordance with the approved rehabilitation plan. Only one road or access route will be permitted to each site requiring access. Any existing transportation or utility rights-of-way will be used wherever practicable to minimize adverse environmental impacts and the proliferation of separate rights-of-way.

- Access roads necessary for operation and maintenance of the project will be clearly identified. Some of these access roads may be designated by the authorizing agency as closed for public use, including but not limited to, off-road vehicular travel.

- The Company shall obtain necessary access permits from the county and Wyoming Highway Department for approach to a county, state, or U.S. highway prior to commencing any construction activity associated with the (grant, permit).

- The Company shall be responsible for preventive and corrective road maintenance from the beginning to completion of operations

under this (grant, permit). This may include, but not be limited to, blading roadway, cleaning ditches, and drainage facilities, dust abatement, or other requirements as directed by the Authorized Officer.

RECREATION/H_2S RECEPTORS-OVERLAY 14

SOURCE

Recreational use areas were based on existing FS and BLM maps as well as interviews with agency personnal. "H_2S receptors", or areas where human presence is likely, throughout the well field are based on aerial photography (see Figure 2-1).

USE

This overlay can be used to consider recreational resources in planning facilities. It also identifies areas where humans would likely be exposed to toxic H_2S should a blowout or pipeline rupture occur. The overlay could be used with the facility map (Overlay 1) in planning block valve locations and evacuation tactics. The overlay could be revised periodically to include phone numbers of residents and field operators that should be notified in the event of an emergency.

STIPULATIONS AND MITIGATION MEASURES

Several types of mitigation have been developed relative to Recreation and Health and Safety issues for the well field. The Health and Safety recommendations are based on extensive modeling of potential accident scenarios. The user should refer to the Health and Safety Technical Report for additional detail.

Committed Mitigation Measures

No committed measures were developed for recreation resources.

- Measure: Companies will be required to provide automatic shut down systems on sour gas trunk lines for all block valves.
- Measure: Companies will be required to have automatic shut down systems for all sour gas wells within the Riley Ridge well field.

- Measure: Companies will develop community contingency and evacuation plans for Calpet, LaBarge, Big Piney, and Marbleton in coordination with the public safety organizations including community civil defense organizations, sheriff, highway patrol, and fire departments, etc., for accidental release of H_2S and in accordance with appropriate federal and state regulations. Plans will include early warning and mass alert systems.

- Measure: The applicants must use the best available engineering design (i.e., alignment, block valve type and spacing, pipe grade, etc.), best construction techniques (i.e., pipe depth, hydrostatic testing, etc.), and monitoring plans (i.e., surveillance, warning signs, etc.) as approved by the Authorized Officer to minimize both the probability of rupture and radius of exposure in the event of an accidental pipeline release of sour gas. In all cases, the pipelines will be located and designed so that the predicted levels of H_2S, in the event of rupture, will not exceed 500 parts/million instantaneous at any of the sensitive receptors shown on Map 2-1 of the DEIS. The methodology to be used in predicting the levels will be the same as used in the Health and Safety Technical Report, pages 3-23 through 3-37. As part of the CU Plan, the applicants must submit a certification letter to the authorized officer stating that these criteria have been met.

- Measure: Drilling operators will be required to identify in their H_2S contingency plans readily available sources of fuel gas in the area during drilling operations. This gas could be added at the flare stack to burn the H_2S in the event of an uncontrolled blowout.

- Measure: All applicants will be required to have a gas-assisted flare mechanism at the plant site to flare the non-combustible sour gas in the event of a plant upset.

Uncommitted Mitigation Measures

Sublette and Lincoln County agencies could pass zoning regulations that could retrict the construction of new residences or businesses near sour gas pipelines or approved sour gas pipeline rights-of-way. This would help keep potential health and safety impacts at as low a level as possible during the operational life of the pipelines.

Recreation:

- The companies could work with federal land managing agencies and WGF to develop an Environmental Awareness Program to provide reinforcement of constructive public attitudes and actions toward preserving and protecting the environment. The companies with Riley Ridge activities could jointly fund such a program. This program would include establishment of local conservation projects and programs, and annual awards to conservation minded staff or those who report problems related to management of the environment. Relative to recreation the program could inform employees and other community residents of recreational opportunities, regulations, and ways to help reduce impacts of over use.

- If fishing pressure were to result in abuse of the special regulations and management areas for Colorado River cutthroat trout, WGF could reconsider their management of the Colorado River cutthroat trout including changing or implementing stocking programs and penalties. This could be in conjunction with a concurrent reassessment by the BLM and FS of their stream management strategies.

- In order to protect one of the few pure populations of Colorado River cutthroat trout in Wyoming, North Beaver Creek could be closed to fishing. Closure to fishing would allow this population to be undisturbed, serve as a control to compare with populations from other streams, and minimize impacts to management plans and scientific research currently underway.

- Mitigation measures dealing with an increased regional population could include limiting the number of hunting licenses, modification of length of season, imposition of bag limits, limited quota hunting, stocking of local streams, increased numbers and use of game wardens, or stricter enforcement of existing regulations. These measures, if implemented, would control but not eliminate the significant recreation impacts.

- Companies could contribute funds to land managing agencies to augment maintenance of development and dispersed recreational areas.

- Companies could develop an anti-vandalism program for personnel with regards to existing range improvements and other structures on federal lands, and could ensure disciplinary action in the event such vandalism were to occur.

Applicants Standard Operating Procedures

No specific measures for Health and Safety or Recreation are listed in the standard operating procedures. The user should review the various applicants' right-of-way applications.

Special Lease Stipulations

No specific measures for Health and Safety or Recreation are in effect.

Well Field Oil and Gas Operating Measures

No specific measures were developed for Health and Safety or Recreation.

General Measures

- The Company will be required to control off-road vehicular use within these (rights-of-way, permits).

During construction, the Holder shall regulate access and vehicular traffic as required to protect the public, wildlife, and livestock from hazards associated with the project. The Holder shall permit free and unrestricted public access to and upon the right-of-way except in areas designated as restricted by the Holder. All restricted areas shall be approved in advance in writing by the Authorized Officer.

The Holder shall be allowed, with prior written approval from the Authorized Officer, to close the road to public access for limited periods during the construction phase of the project should it be necessary to do so to protect and insure public health and safety. At all other times, the Holder shall permit free and unrestricted public access to and upon the right-of-way.

Roading Guidelines

No specific measures were developed for Health and Safety or Recreation.

Erosion Control, Revegetation, and Restoration Guidelines

No specific measures were developed for Health and Safety or Recreation.

CULTURAL RESOURCES OVERLAY 15

SOURCE

Cultural resources were determined from a Class I file search conducted for the DEIS by Metcalf-Zier under contract to ERT. Records from the Office of the Wyoming State Archaeologist at the University of Wyoming, the BLM Rock Springs District Office, the BLM Kemmerer Area Office, the Bridger-Teton National Forest (Jackson), the State Historic Preservation Office (Cheyenne), and the Coe Library at the University of Wyoming (Laramie) were reviewed for information pertinent to cultural and historic resources. Locations were mapped and tabulated in standard format (see Cultural Resources Technical Report).

USE

The overlay indicates areas where cultural resources are likely to occur and provides a system for updating the data base as new cultural resource clearances are done in the well field.

STIPULATIONS AND MITIGATION MEASURES

Committed Mitigation Measures

No specific measures for Cultural Resources were developed.

Uncommitted Mitigation Measures

No specific measures for Cultural Resources were developed.

Applicants Standard Operating Procedures

No specific measures for Cultural Resources were developed.

Special Lease Stipulations

No specific measures for Cultural Resources were developed.

Well Field Oil and Gas Operating Measures

No specific measures for Cultural Resources were developed.

General Measures

- Prior to any surface disturbing activity, the Company, in consultation with the Authorized Officer and the Wyoming State Historic Preservation Officer, shall make an inventory of all archaeological and historical sites within these (rights-of-way, permits) areas if it has not previously been done. The Company shall develop a cultural resources plan to locate cultural resources which would be directly affected by the project through the use of a Class III field survey. The plan will define inventory extent and intensity of the site-specific surveys.

- Any cultural resource (historic or prehistoric site or object) discovered by the Company or any person working on his behalf, shall be immediately reported to the Authorized Officer. The Company shall suspend all operations in the area of such discovery until written authorization to proceed is issued by the Authorized Officer. An evaluation of the discovery will be made by the Authorized Officer and state to determine appropriate actions to prevent the loss of significant cultural values. The Company will be responsible for the cost of evaluations and for mitigation. Mitigation may include rerouting or excavation, and any decision as to proper mitigation measures will be made by the Authorized Officer after consulting with the Holder.

- The Company will provide an archaeologist with a current Wyoming Antiquities Permit to execute and monitor surveys and discoveries during construction of all project facilities.

- The Company will provide a qualified paleontologist who would be approved by the Authorized Officer. The paleontologist will conduct an intensive survey of all areas to be disturbed according to the significance and mitigation needs. The paleontologist will be available, as needed, during surface disturbance. If the paleontologist determines that values will be disturbed, construction will be halted until appropriate action can be taken.

Roading Guidelines

No specific measures for Cultural Resources were developed.

Erosion Control, Revegetation and Restoration Guidelines

No specific measures for Cultural Resources were developed.

VISUAL RESOURCES - VRM/VQL CLASSIFICATION-OVERLAY 16

SOURCE

This overlay was developed from a visual resource inventory conducted by EDAW Inc., in the summer of 1982. The inventory process used for BLM administered lands was based on BLM's Visual Resource Management (VRM) program procedures. The inventory process used for FS administered lands was based upon the FS Visual Management System (VMS) program procedures. The inventory results were reviewed with agency technical representatives.

USE

This overlay indicates levels of visual resource value. It is used in combination with the Visibility Index (Overlay 17) and Landscape Condition (Overlay 18) along with the matrices shown in Table 6-1 (for FS administered lands) and Table 6-2 (for BLM lands) to determine sensitivity. The process is described below in sequential steps.

1. Stack-up overlays 16, 17, and 18 on a base map.

2. Determine whether the area of interest is on FS or BLM lands (these lands are labeled and separated by a dashed line on all overlays).

TABLE 6-1

PREDICTED COMPATABILITY WITH VISUAL QUALITY OBJECTIVES

Forest Service		Proposed Facility Type and Condition							
Landscape Type	Visibility Index	Pipeline Gathering (looking across ROW)	Pipeline Gathering (looking down ROW)	Electric Distribution (looking across ROW backdropped poles)	Electric Distribution (looking down ROW or skylined poles)	Access Roads - New (looking across/ looking down)	Well Sites - in critical foreground (Construction/ Operation)	Well Sites - all others (Construction/ Operation)	>6 ac/<6 ac
Mosaic Vegetation/ Low Land Form	L	PR	PR	PR	PR	M/M	UM/UM	UM/M	MM/M
Mosaic Vegetation/ Low Land Form	M	PR	PR	PR	PR	M/M	---	MM/M	MM/M
Mosaic Vegetation/ Low Land Form	H	R	R	R	R	PR/PR	---	M/PR	M/PR
Mosaic Vegetation/ Moderate Land Form	L	PR	PR	PR	PR	PR/M	UM/UM	MM/PR	M/PR
Mosaic Vegetation/ Moderate Land Form	M	R	R	R	R	R/PR	---	M/PR	M/PR
Mosaic Vegetation/ Moderate Land Form	H	R	R	R	R	R/PR	---	PR/R	PR/R
Mosaic Vegetation/ High Land Form	L	R	PR	R	PR	PR/PR	UM/UM	M/PR	M/PR
Mosaic Vegetation/ High Land Form	M	R	R	R	R	R/PR	---	M/PR	M/PR
Mosaic Vegetation/ High Land Form	H	R	R	R	R	R/R	---	PR/R	PR/R
Conifer/Low Land Form	L	R	M	R	M	PR/M	UM/UM	MM/M	MM/M
Conifer/Low Land Form	M	R	M	R	M	PR/M	---	MM/M	MM/M
Conifer/Low Land Form	H	R	PR	R	PR	R/PR	---	M/PR	M/PR
Conifer/Moderate Land Form	L	R	M	R	M	PR/M	UM/UM	M/PR	M/PR
Conifer/Moderate Land Form	M	R	M	R	M	R/M	---	M/PR	M/PR
Conifer/Moderate Land Form	H	R	PR	R	PR	R/PR	---	PR/R	PR/R

TABLE 6-1 (CONTINUED)

Forest Service Landscape Type	Visibility Index	Proposed Facility Type and Condition: Pipeline Gathering (looking across ROW)	Pipeline Gathering (looking down ROW)	Electric Distribution (looking across ROW backdropped poles)	Electric Distribution (looking down ROW or skylined poles)	Access Roads - New (looking across/ looking down)	Well Sites - in critical foreground (Construction/ Operation)	Well Sites - all others (Construction/ Operation)	>6 ac/<6 ac
Conifer/High Land Form	L	R	M	R	M	R/M	UM/UM	PR/R	PR/R
Conifer/High Land Form	M	R	M	R	M	R/PR	---	R/R	R/R
Conifer/High Land Form	H	R	PR	R	PR	R/PR	---	R/R	R/R
Short Vegetation/Low Land Form	L	PR	PR	PR	PR	M	UM/UM	UM/MM	UM/MM
Short Vegetation/Low Land Form	M	PR	PR	PR	PR	M	---	UM/MM	MM/MM
Short Vegetation/Low Land Form	H	R	R	R	R	PR	---	MM/M	MM/M
Short Vegetation/ Moderate Land Form	L	PR	PR	PR	PR	M	UM/UM	UM/MM	MM/MM
Short Vegetation/ Moderate Land Form	M	PR	PR	PR	PR	M	---	UM/MM	MM/MM
Short Vegetation/ Moderate Land Form	H	R	R	R	R	PR	---	M/M	M/M
Short Vegetation/High Land Form	L	R	PR	PR	PR	PR/M	UM/UM	MM/PR	M/PR
Short Vegetation/High Land Form	M	R	R	R	R	R/PR	---	M/PR	M/PR
Short Vegetation/High Land Form	H	R	R	R	R	R/R	---	PR/PR	PR/PR
Aspen Vegetation/Low Land Form	L	R	M	R	M	PR/M	UM/UM	MM/M	M/M
Aspen Vegetation/Low Land Form	M	R	M	R	M	PR/M	---	MM/M	M/M
Aspen Vegetation/Low Land Form	H	R	PR	R	PR	PR/M	---	M/PR	M/PR

TABLE 6-1 (CONTINUED)

Forest Service Landscape Type	Visibility Index	Proposed Facility Type and Condition: Pipeline Gathering (looking across ROW)	Pipeline Gathering (looking down ROW)	Electric Distribution (looking across ROW backdropped poles)	Electric Distribution (looking down ROW or skylined poles)	Access Roads - New (looking across/ looking down)	Well Sites - in critical foreground (Construction/ Operation)	Well Sites - all others (Construction/ Operation)	>6 ac/<6 ac
Aspen Vegetation/ Moderate Landform	L	R	M	R	M	PR/M	UM/UM	M/PR	M/PR
Aspen Vegetation/ Moderate Landform	M	R	M	R	M	R/M	---	M/PR	M/PR
Aspen Vegetation/ Moderate Landform	H	R	PR	R	PR	R/PR	--	PR/R	PR/R
Aspen Vegetation/ High Land Form	L	R	M	R	M	R/M	UM/UM	PR/R	PR/R
Aspen Vegetation/ High Land Form	M	R	M	R	M	R/PR	---	R/R	R/R
Aspen Vegetation/ High Land Form	H	R	PR	R	PR	R/PR	---	R/R	R/R

TABLE 6-2

PREDICTED COMPATIBILITY WITH BLM VISUAL MANAGEMENT CLASS OBJECTIVES

BLM		Proposed Facility Type and Condition								
Landscape Type	Visibility Index	Buried Pipeline (looking across ROW, also buried TL)	Buried Pipeline (looking down ROW, buried TL)	Access Road - New (looking across/ looking down)	Access Road Upgrade	Electric Distribution (looking across ROW or backdropped)	Electric Distribution (looking down ROW or skylined)	Well Site - in Critical Foreground (Construction/ Operation)	Well Sites - all other (Const/Oper)	>6 ac/<6 ac
Sagebrush Grasslands	H	II	III	II/III	II	III	III	V/V	---	IV/III
Sagebrush Grasslands	M	II	III	II/III	II	II	III	---	---	IV/III
Sagebrush Grasslands	L	II	II	III	II	II	II	---	---	III/III
Disturbed Sagebrush Grassland	H	II	II	II	II	II	II	---	---	III/III
Disturbed Sagebrush Grassland	M	II	II	II	II	II	II	---	---	III/II
Disturbed Sagebrush Grassland	L	II	II	II	II	II	II	---	---	II/II
Steeply Rolling Sagebrush	H	III	III	IV	II	II	III	---	---	---
Steeply Rolling Sagebrush	M	III	III	III	II	II	II	---	---	---
Steeply Rolling Sagebrush	L	II	II	II	II	II	II	---	---	---
Modified Steeply Rolling Sagebrush	H	II	II	II	II	II	II	---	---	---
Modified Steeply Rolling Sagebrush	M	II	II	II	II	II	II	---	---	---
Modified Steeply Rolling Sagebrush	L	II	II	II	II	II	II	---	---	---

TABLE 6-2 (CONTINUED)

BLM Landscape Type	Visibility Index	Proposed Facility Type and Condition: Buried Pipeline (looking across ROW, also buried TL)	Buried Pipeline (looking down ROW, buried TL)	Access Road - New (looking across/ looking down)	Access Road Upgrade	Electric Distribution (looking across ROW or backdropped)	Electric Distribution (looking down ROW or skylined)	Well Site - in Critical Foreground (Construction/ Operation)	Well Sites - all other (Const/Oper)	>6 ac/<6 ac
Badlands Scarp	H	V	V	V	IV	V	V	V/V	---	V/V
Badland Scarp	M	IV	IV	IV	III	IV	IV	---	---	V/IV
Badland Scarp	L	III	III	III	II	III	III	---	---	IV/IV
Disturbed Badland Scarp	H	III	III	III	II	III	III	---	---	IV/IV
Disturbed Badland Scarp	M	II	II	II	II	II	II	---	---	IV/III
Disturbed Badland Scrap	L	II	II	II	II	II	II	---	---	III/III
Green River Tributaries	H	II	III	II/III	II	III	III	V/V	V/IV	V/IV
Green River Tributaries	M	II	III	II	II	II	III	---	V/IV	IV/IV
Green River Tributaries	L	II	II	II	II	II	II	---	IV/III	III/III
Steep Sage Hillsides	H	III	III	IV	II	III	III	V/V	---	V/IV
Steep Sage Hillsides	M	III	III	III	II	III	III	---	---	V/IV
Steep Sage Hillsides	L	II	II	II	II	II	II	---	---	IV/III
Modified Steep Sage Hillsides	H	II	II	II	II	---	---	---	---	IV/III
Modified Steep Sage Hillsides	M	II	II	II	II	---	---	---	---	III/III
Modified Steep Sage Hillsides	L	II	II	II	II	---	---	---	---	III/II

TABLE 6-2 (CONTINUED)

BLM Landscape Type	Visibility Index	Proposed Facility Type and Condition: Buried Pipeline (looking across ROW, also buried TL)	Buried Pipeline (looking down ROW, buried TL)	Access Road - New (looking across/ looking down)	Access Road Upgrade	Electric Distribution (looking across ROW or backdropped)	Electric Distribution (looking down ROW or skylined)	Well Site - in Critical Foreground (Construction/ Operation)	Well Sites - all other (Const/Oper)	>6 ac/<6 ac
Modified Prominent Ridges	H	III	III	III	II	II	II	---	---	IV/III
Modified Prominent Ridges	M	II	II	II	II	II	II	---	---	III/III
Modified Prominent Ridges	L	II	II	II	II	II	II	---	---	III/II
Steeply Sloping Sage Ridge Complex	H	III	III	IV	II	III	III	V/V	V/IV	V/IV
Steeply Sloping Sage Ridge Complex	M	III	III	III	II	II	III	---	V/IV	IV/V
Steeply Sloping Sage Ridge Complex	L	II	II	II	II	II	II	---	---	IV/IV
Mosaic	H	III	III	III/IV	II	III	III	V/V	V/IV	IV/IV
Mosaic	M	III	III	II/III	II	III	III	---	IV/III	IV/III
Mosaic	L	II	II	II/III	II	II	II	---	---	III/III
Forested Ridges	H	II	IV	II/IV	II/III	II	IV	V/V	IV/III	IV/III
Forested Ridges	M	II	IV	II/IV	II	II	IV	---	IV/III	III/III
Forested Ridges	L	II	III	II/III	II	II	III	---	---	III/II
Broken Mountain Slopes	H	II	IV	II/IV	II/III	II	III	V/V	V/IV	V/IV
Broken Mountain Slopes	M	II	III	II/III	II/II	II	III	---	IV/III	IV/III
Broken Mountain Slopes	L	II	II	II/II	II/II	II	II	---	---	III/III

TABLE 6-2 (CONTINUED)

BLM Landscape Type	Visibility Index	Proposed Facility Type and Condition: Buried Pipeline (looking across ROW, also buried TL)	Buried Pipeline (looking down ROW, buried TL)	Access Road - New (looking across/ looking down)	Access Road Upgrade	Electric Distribution (looking across ROW or backdropped)	Electric Distribution (looking down ROW or skylined)	Well Site - in Critical Foreground (Construction/ Operation)	Well Sites - all other (Const/Oper)	>6 ac/<6 ac
Aspen Lowlands	H	II	III	II/III	II	II	III	V/V	---	IV/IV
Aspen Lowlands	M	II	II	II/III	II	II	II	---	---	IV/II
Aspen Lowlands	L	II	II	II/II	II	II	II	---	---	III/III

3. Select the corresponding matrix for the analysis. If the area of interest is on FS lands, use the matrix in Table 6-1 for the analysis; if it is on BLM lands, use the matrix in Table 6-2 for the analysis).

4. Determine the proposed facility type and landscape condition for the area of interest from Overlay 18 and locate it along the left-most column in the matrix.

5. Determine the visibility index level from Overlay 17 for the area of interest and locate it as a subheading of the landscape type in the second column of the matrix (this determines the appropriate row of the matrix).

6. Move across the top of the matrix to locate the facility type of interest. If there is more than one column for that facility, choose the column which best describes the viewing conditions (e.g., looking across or down the ROW) or phase (i.e., construction or operation) of interest.

7. Find the intersection point of this column and row to determine the highest VRM/VQL level that the facility of interest could meet under those landscape and visibility conditions.

8. Refer to Overlay 16 to determine the VRM/VQL classification for the area of interest. If the VRM/VQL classification for that area is higher than that shown in the matrix, this indicates that the proposed facility would not meet the visual resource management guidelines for that area. If the VRM/VQL classification for that area is equal to or lower than that shown in the matrix, it indicates that the facility would not result in a significant impact in that location.

STIPULATIONS AND MITIGATION MEASURES

Committed Mitigation Measures

- Measure: The following gathering pipeline segment will be relocated off the steep forested slopes: the pipeline from the well in Section 13, T29N, R115W, will be rerouted to follow the road to the proposed well in Section 18 T29N, R114W.

- Measure: In forested areas, pipelines will cross existing roads in a configuration that provides visibility of only short segments of the corridor by making a jog soon before and after crossing. Deviations or exceptions based on slope or other technical problems must be approved by the Authorized Officer.

- Measure: Where possible, power distribution lines in the well fields will be placed underground and located in the pipeline or road rights-of-way within ½ mile of sensitive viewpoints, including: Middle Piney Creek Road, South Piney Creek Road

(including Snider Basin), Indian Creek/Coal Creek Road, Pine Grove Ridge Road and upper Beaver Dam Creek Road (in Sections 3, 4, and 5, R114W, T27N). Others may be determined by the Authorized Officer.

- Measure: Wires, conductors, insulators, and towers of transmission lines will have a dull finish to reduce reflection and visibility of the structures. If the Authorized Officer determines that certain distribution lines should use nonreflective materials, then it may be required.

- Measure: Where directed by the authorized officer within the analyzed mile-wide corridors, transmission lines located along valley floors will be situated such that the structures follow the landform break or vegetative change between the valley floor and sideslopes to reduce the visibility of the structures.

- Measure: The UP&L transmission line segment running from the proposed Big Mesa plant site to the proposed substation will be relocated off the prominent ridge top location. It will run northeast from the proposed Big Mesa plant site to the Dry Piney Creek Road and follow the road to the substation site.

- Measure: The companies will be required to remove litter including broken equipment, work trash, and other man-produced material, from well field units, plant sites, and other areas of operation. Litter will be disposed of in approved sites.

Uncommitted Mitigation Measures

No specific measures for Visual Resources were developed.

Applicants Standard Operating Procedures

No specific measures for Visual Resources were developed.

Special Lease Stipulations

No specific measures for Visual Resources were developed.

Well Field Oil and Gas Operating Measures

No specific measures for Visual Resources were developed.

General Measures

- A plan to minimize visual impacts from structures will be required as a part of the CU Plan. The holder will design the pipeline routes and ancillary structures to blend into the existing

environment so as to meet the minimum degree of contrast acceptable for the Visual Resources Management Class and Visual Quality Objectives in which the structures would be located. The Authorized Officer will evaluate and approve measures before construction begins.

- The Company shall paint all permanent structures (on site for a period longer than 90 days after construction) a flat, noncontrasting color that is harmonious with the adjacent landscape. Exceptions to this requirement would be determined on a case-by-case basis by the authorized officer because of varying levels of sensitivity, or structures which require safety coloration in accordance with Occupational Safety and Health Administration requirements. Prior to use, color selection will be approved by the Authorized Officer.

Roading Guidelines

Select wildlife habitat, riparian zones, unstable soil areas, threatened and endangered plant locations, side slopes over 40 percent, wetlands, ardraeological sites, sensitive visual areas, and watershed areas should be avoided.

Erosion Control, Revegetation, and Restoration Guidelines

No specific measures for Visual Resources were developed.

VISUAL RESOURCES - VISIBILITY INDEX-OVERLAY 17

SOURCE

This Overlay was developed by EDAW Inc., through an inventory of viewer conditions in the study area during the summer of 1982. These viewer conditions included such variables as volume of use/times seen; duration of view, aspect relative to the viewer, viewer use association and viewing distance. This data was combined according to different procedures for the BLM and FS lands.

USE

See preceding discussion for Overlay 16.

STIPULATIONS AND MITIGATION MEASURES

See preceding discussion for Overlay 16.

VISUAL RESOURCES, LANDSCAPE CONDITION-OVERLAY 18

SOURCE

This overlay was generated from data gathered by EDAW Inc., during the summer of 1982. Landscape variables making up this overlay include slope, slope complexity, vegetation type, vegetative pattern, and structures or disturbance condition. As with the visibility index, this information was combined according to different procedures for BLM and FS, and hence the different patterns for lands managed by thse two agencies.

USE

See preceding discussion for Overlay 16.

STIPULATIONS AND MITIGATION MEASURES

See preceding discussion for Overlay 16.

REFERENCES

Law, D. L., L. L. Linscott, and R. L. Hopkins. 1981. Rehab. Oil and Gas Technical Bulletin No. 1. Bureau of Land Management, Wyoming State Office, Cheyenne.

Lines, G. C. and W. R. Glass. 1975. Water resources of the Thrust Belt of western Wyoming. Hydrologic Investigations Atlas HA-539. U.S. Geological Survey, Reston, VA.

Welder, G. E. 1968. Ground water reconnaissance of the Green River Basin southwestern Wyoming. Hydrologic Investigations Atlas HA-290. U.S. Geological Survey, Washington, D.C.

APPENDIX A

EROSION CONTROL, REVEGETATION, AND RESTORATION GUIDELINES

EROSION CONTROL, REVEGETATION, AND RESTORATION GUIDELINES

Standard procedures for the Company will include implementation of erosion control and revegetation measures to assure that lands disturbed by construction and operation activities will be restored to a stable, productive, and aesthetically acceptable condition.

A detailed, site-specific reclamation plan will be developed and become part of the Construction and Use (CU) Plan submitted by each company under the requirements of the rights-of-way grants. Because the proposed rights-of-way are composed of many types of terrain, soils, vegetation, land uses, and climatic conditions, the detailed plan will include sets of techniques and measures tailored to each condition encountered. Preparation of the plans will use existing soils and geologic data and where determined necessary by the Authorized Officer, additional data will be collected. Local expertise and locally effective reclamation methods will be followed when the site-specific procedures for the detailed reclamation plan are developed. The CU Plan will be approved by the Authorized Officer and implemented by the Companies.

Detailed information regarding applicable techniques and technical assistance to private landowners concerning erosion control measures and reclamation procedures will be obtained from the Soil Conservation Service through local Soil Conservation Districts. Technical assistance and approval of written plans for federal lands would be obtained from the BLM and FS prior to any construction.

During construction, operation, and abandonment of the project, applicants will provide an experienced reclamation specialist for (1) liaison with private landowners, federal agencies, and local government; (2) direction for timely restoration requirements; and (3) favorable public relations.

General erosion control and restoration guidelines have been developed for the following areas and will be included as part of the CU Plan:

- Right-of-Way and Site Clearing.
- Site Preparation, Trenching, and Preservation of Topsoil.
- Backfilling and Grading.
- Land Preparation and Cultivation.
- Revegetation.
- Maintenance and Monitoring.
- Use of Chemicals.
- Construction Timing.
- Stream Protection.

RIGHT-OF-WAY AND SITE CLEARING

Emphasis will be placed on protecting existing vegetation and minimizing disturbance of the existing environment.

- Land grading will be done only on the area required for construction.

- Existing roads will be used for vehicle traffic where possible; vehicles and equipment will not be allowed in streambeds unless specified by the authorizing agency.

- Sidehill cuts will be kept to a minimum to ensure resource protection and a safe and stable plane for efficient equipment use. The authorizing agency will provide assistance and will approve sidehill cuts prior to construction.

- Existing ground cover such as grasses, leaves, roots, brush, and tree trimmings will be cleared and piled only to the extent necessary. Slash will be piled and later use in restoration operations or disposed of at the discretion of the authorized agency official.

- Trees and shrubs on the right-of-way that are not cleared will be protected from damage during construction.

- Where the right-of-way crosses streams and other water bodies, the banks will be stabilized to prevent erosion. Construction techniques will minimize damage to shorelines, recreational areas, and fish and wildlife habitat. A channel stability evaluation will be completed before stream crossing locations are finalized. Channel stability ratings of 1 or 2 shall be avoided (Forest Service 1978b).

- Care will be taken to avoid oil spills and other types of pollution in all areas, including streams and other water bodies and in their immediate drainages. All spills will be immediately cleaned up following notification of applicable State and Federal agencies.

- Design and construction of all temporary and permanent roads will be based on an approved transportation plan and will ensure proper drainage, minimize soil erosion, and preserve topsoil. After abandonment, these roads will be closed and areas restored without undue delay or maintained at the discretion of the landowners. Restoration, including redistribution of topsoil and establishment of natural surface drainage patterns, will be to the satisfaction of the landowner and/or authorizing official.

- During adverse weather conditions, as determined by the on-site reclamation specialist and federal agency officials, the authorizing agency will issue stop and start orders to prevent rutting or excessive tracking of soil and deterioration of vegetation in the right-of-way area.

- During construction activities in or near streams or lakes, sedimentation (detention) basins and/or straw bale filters will be constructed to prevent suspended sediments from reaching downstream water courses or lakes as required by the authorizing officer.

- If construction through extensive wetland areas is deemed necessary, construction will occur during the driest period of the year and/or erosion control mats will be used to minimize erosion damage to wetland sites, as required by the Authorizing Officer.

- Actual construction activities and implementation of erosion control measures will immediately follow clearing operations, especially in areas with soils that are highly susceptible to wind or water erosion and other special areas.

SITE PREPARATION, TRENCHING, AND PRESERVATION OF TOPSOIL

Site Preparation and trenching methods and techniques will ensure that:

- Topsoil is removed from the trench area, windrowed separately, protected, and replaced last during backfilling. This procedure and the depth of such topsoil removal will be specified by the Authorizing Officer.

- Topsoil will be removed from facility site areas (e.g., drill pads and roads) and stored for replacement on disturbed surface areas after final backfilling and grading.

- Remaining unearthed materials are removed and stored in a manner that facilitates backfilling procedures, uses a minimum amount of right-of-way area, and protects the excavated material from vehicular and equipment traffic.

- A specific trenching and excavated material stockpiling procedure will be used on steep-sloping and rough, broken terrain to ensure minimum disturbance as outlined in the CU Plan. This procedure will be developed by both the Authorized Officer and applicant.

BACKFILLING AND GRADING

The following backfilling and grading techniques will be used:

- Backfill will be replaced in a sequence and density similar to the preconstruction soil condition.

- Backfilling operations will be conducted in a manner that would minimize further disturbance of vegetation.

- The contour of the ground will be restored to permit normal surface drainage.

- In strongly sloping and steep terrain, erosion control structures such as water bars, diversion channels, and terraces will be constructed to divert water away from the pipeline trench and reduce soil erosion along the right-of-way and other adjoining areas disturbed during construction.

- All structures such as terraces, levees, underground drainage systems, irrigation pipelines and canals will be restored to preconstruction conditions.

- The surface will be graded to conform to the existing surface of the adjoining areas except for a slight crown over the trench to compensate for natural subsidence. In cropland areas, especially border and furrow irrigated cropland, the soils will be compacted and the crown will be smoothed to match the bordering area to allow surface irrigation.

- Topsoil will be uniformly replaced over the trench fill and other disturbed areas to restore productivity to its preconstruction condition.

- Materials unsuitable for backfilling or excess backfill material will be disposed of as arranged by the authorizing officials.

- Temporary work space areas used at stream and highway crossings and other special sites will be restored to approximate preconstruction conditions and to the satisfaction of the authorizing officials.

- The right-of-way at stream crossings will be restored to preconstruction conditions. The upland areas and banks will be revegetated to preconstruction conditions. Where this is not possible, they will be mulched with rock. The size of the rock mulch will be larger in diameter than materials excavated from the trench. The streambed will be returned to its original contours with sediments like those that were excavated.

- Well sites will be restored without undue delay and maintained at the discretion of the landowners. Restoration including grading and redistribution of topsoil, will be to the satisfaction of the landowner and/or Authorized Officer.

LAND PREPARATION FOR SEEDING AND CULTIVATION

Construction, backfilling, and grading activities commonly cause compaction and alter soil conditions that affect soil productivity and/or seeding success in the right-of-way area. The following practices and techniques will be used to improve these soil conditions, protect soil from erosion, and provide a favorable seedbed:

- In cropland areas, as required by the authorizing agency or landowner, subsoiling or chiseling will be used to ensure that soil compaction is reduced and preconstruction soil permeability is restored.

- Chiseling will be used, unless objected to by the landowner or authorizing agency, in rangeland areas to reduce compaction and improve soil permeability. Pitting and contour furrowing as directed by the authorizing agency or landowner will be done on steep slopes of disturbed areas to increase infiltration and to reduce runoff and erosion.

- Suitable mulches and other soil stabilizing practices will be used on all regraded and topsoiled areas to protect unvegetated soil from wind and water erosion and to improve water absorption.

- Special mulching practices or matting will be used, as necessary, in critical areas where wind and water are serious erosion hazards to protect seeding, seedlings after germination, and plantings.

- Commercial fertilizers will be applied to soil areas with low inherent fertility to maintain crop yields and establish grass seedings. Application rates will be commensurate with annual precipitation and available irrigation water.

- Seedbeds for areas seeded to grass will be prepared to provide a firm and friable condition suitable for the establishment of vegetation.

- Rock mulches will be used in steep-sloping rock outcrop areas and low precipitation areas to reduce erosion and promote vegetal growth.

- Cultivation and land preparation operations on steeply sloping areas will be done on the contour to minimize erosion.

- Soil area with rock fragments, such as very coarse gravel, cobble, or stone scattered on the surface, will be restored to the original preconstruction surface condition to blend with the adjoining area, to avoid a smooth surface right-of-way area, and to control accelerated erosion.

REVEGETATION (RESEEDING AND PLANTING)

The loss of vegetation from lands disturbed by pipeline construction can be mitigated only by satisfactory revegetation. To ensure a successful revegetation program, methods and procedures will be consistent with local climate and soil conditions and will consider recommendations and directions of local experts. Revegetation efforts will be continued until a satisfactory vegetative cover is established. The following practices and techniques will be used in areas where reseeding is suitable as determined by the authorizing agency:

- A firm seedbed will be prepared prior to seeding. This will include a mulch of plant residues or other suitable materials. A cover crop will be used as necessary in larger disturbed areas.

- Seed will be planted by drilling, broadcasting, or hydroseeding. Drilling is the preferred method because it is usually most successful. Drill seeding with a grass drill equipped with depth bands will be used where topography and soil conditions allow operation of equipment to meet the seeding requirements of the species being planted. Broadcast seeding will be used for inaccessible or small areas. Seed will be covered by raking or harrowing. Hydroseeding will be done in critical areas determined by the reclamation specialist or authorizing officer.

- Only species adaptable to local soil and climatic conditions will be used. Generally, these will be native species. However, introduced species may be considered for specific conditions when approved by the landowner and regulatory authority. Seeding rates in critical area plantings and generally throughout the right-of-way will be increased 100 percent over regular seeding rates to allow for seed mortality due to adverse growing conditions.

- Seed testing will be conducted to meet state, federal, and agency seed requirements.

- Seeding will be done when seasonal or weather conditions are most favorable, as determined by the landowner or authorizing officer.

- Grazing or mowing may be delayed at least one season after seeding to provide time for vegetation to become established, especially in highly erodible areas, unless objected to by the landowner or lessee. Protective fencing may be necessary in special areas and will be constructed, maintained, and removed according to authorizing agency specifications.

- In areas of low annual precipitation (generally less than 8 to 10 inches), where reseeding is not suitable or as successful, erosion control structures and measures will be applied on sloping areas

to reduce accelerated erosion, to allow re-establishment of preconstruction surface soil conditions, and to allow natural revegetation.

- Trees and shrubs will be reestablished in areas as specified in the revegetation plan. Temporary and/or permanent barriers to off-road vehicle access will be installed by the Company at specific locations along the right-of-way and other disturbed sites to prevent off-road vehicle access as specified by the authorizing agency.

MAINTENANCE AND MONITORING

Joint inspection of the right-of-way by the applicant and authorizing agency will be conducted to monitor the success and maintenance of erosion control measures and revegetation programs on disturbed land for two growing seasons, or for a period determined by the landowner on private land, or the authorized agency official on state or federal land. The monitoring program will identify problem areas and corrective measures to ensure vegetation cover and erosion control. Certification of successful revegetation and erosion control will be determined by the landowner or authorized agency official.

USE OF CHEMICALS

The use of biochemicals such as herbicides, fungicides, and fertilizers will comply with state and federal laws, regulations, and policies regarding the use of poisonous, hazardous, or persistent substances. State and federal wildlife agencies will be contacted if application of any of these substances will be on or near sensitive wildlife areas. Application of these substances will be by ground methods or by helicopter as approved by landowner and authorizing officer. Prior to the use of such substances on or near the permit or grant area, the applicant will obtain approval of a written plan for such use from the authorizing officer, landowner, and appropriate wildlife agency. The plan will outline the kind of chemical, method of application, purpose of application, and other information as required, and will be considered as the authorized procedure for all applications until revoked by the Authorized Officer, landowner, or appropriate wildlife agency. This plan will become part of the CU Plan.

CONSTRUCTION TIMING

Pipeline construction activities on irrigated hay or cropland will be timed, as possible, to avoid disruption of irrigation delivery systems during the major irrigation season to reduce effects on crop production in areas of construction as well as adjoining irrigated cropland areas served by the systems.

Pipeline construction activities in narrow floodplain areas subject to high erosion hazards would be timed to avoid high water flows as much as possible, this would reduce the effects of construction on erosion and sedimentation.

STREAM PROTECTION

To maintain stream bank stability, preserve the hydrologic characteristics of the existing stream channel and flood plain, and minimize adverse changes in stream water chemistry, physical properties, or associated aquatic organisms, the following will be emphasized:

- The natural drainage channels of any stream will be maintained during construction activities wherever possible.
- Clear water diversion methods will be employed whenever construction activities such as pipeline trenching must pass through a stream channel.
- Tree or shrub vegetation, which give greater stability due to rooting structure, will be replaced during the revegetation of channel banks following construction.
- Construction staging and equipment service areas will be located outside of riparian areas.
- Following construction activities, the stream channel will be returned to as nearly the original width, depth, gradient, and curvature as possible.

APPENDIX B

ROADING GUIDELINES FOR GAS EXPLORATION AND DEVELOPMENT WITHIN THE RILEY RIDGE FIELD

APPLICABLE ROAD STANDARDS

The primary road access that an operator will be using will be either a county road or FS/BLM arterial, collector, or local road, or combination of these. In most cases, the actual work site will be some distance removed from the nearest road. The operator may gain access to the work site by locating, designing, and constructing a "temporary road" from a FS or BLM development road to the work site.

The existing FS/BLM and county roads are usually inadequate to facilitate the type and volume of traffic required for exploration and/or development of oil or gas reserves. Prior to use by an operator, the road must be upgraded at the operator's expense to the standard compatible with the proposed road use and FS and BLM classification.

FOREST AND BLM DEVELOPMENT ROADS

Arterials. For purposes of the Riley Ridge Project EIS well field, these are roads that service the entire well field or primary access to plant sites. A FS/BLM or other arterial shall be a double-lane, graded, drained, and surfaced road. The roadbed shall be crowned on tangents and superelevated on curves. The traveled way shall be between 20 and 24 feet in width, depending on the total anticipated traffic and environmental considerations on a site-specific basis. The minimum surface depth on all roads shall be 4 inches of crushed aggregate base or 6 inches of pit run gravel. The typical cross section for a double-lane road is as shown in the "typical sections." Culverts or bridges shall be installed at all minor stream crossings.

Collectors. For purposes of the EIS, these are roads that service several wells. A FS/BLM or other collector shall be either a 14-foot single-lane road with turnouts or a 20 to 24-foot double-lane road. The anticipated traffic volumes will be the basis for determination of the particular standard for a specific road. In many instances, the operator's proposed additional traffic will be sufficient to require upgrading the existing road to a higher standard. If the projected average daily traffic (public, commerical, administrative, operator) exceeds 100 vehicles per day, a double-lane facility will be required.

Locals. For purposes of the Riley Ridge Project EIS, these are roads that service one well. A FS or BLM road shall be a 14-foot wide single-lane road with intervisible turnouts.

Before construction, the FS or BLM (depending upon land status) will determine whether a local road will be obliterated and reclaimed at the completion of the exploration work, assuming a dry-hole is encountered, or whether it will be retained by the FS or BLM and added to the Forest Development Transportation System or the BLM District Transportation Plan. In the latter instance, the road will be constructed with turnouts. However, if it is not to be retained, it may be constructed without turnouts depending on the operator's proposed activities and FS or BLM recommendations as to management.

TEMPORARY ROADS

The term "temporary road" should not be interpreted to imply a lesser standard of construction. Policy is to require that road access to drill sites be properly located, designed, constructed, and maintained by the leasee and/or drilling operator. Such things as FS or BLM directional signs, bridge guard rails, and reduced numbers of turnouts (with appropriate management guidelines) can be designed. A temporary road will be obliterated, if the hole is dry, to requirements that will be described in the EIS/EA process.

PERIOD OF USE

The complexities of drilling in the Overthrust require that the design of roads accommodate all seasons of use unless the operator is willing to accept road closures due to weather. This means designing roads for all-weather access from frost heave to wet soils to dry conditions. The surfacing requirements on any road used by the operator will be dependent upon the type of soils on which the road is constructed. If snow removal will be required on graveled surfaces, additional thickness for anticipated loss must be included.

ROAD LOCATION

Access to work sites may require the construction of temporary roads and/or reconstruction of Forest Development Roads or BLM/county. Proper initial location of these roads will expedite approval of the operator's lease or permit. Some of the factors which must be considered during location are:

Environmental Considerations. Select wildlife habitat, riparian zones, unstable soil areas, threatened and endangered plant locations, side slopes over 40 percent, wetlands, archaeological sites, and watershed areas should be avoided when possible during location studies.

Geotechnical Considerations. Unstable areas, potentially unstable areas, and areas showing evidence of high moisture or free water should be identified and avoided. Soil classification samples should be collected and processed during this period for future road surfacing determinations. Aggregate sources should be identified, tested, and mapped. Roadway excavation areas should be tested to determine the steepest stable cut slopes that could be constructed.

Geometric Considerations. The geometric standards for each particular road must be considered during location. The standards are shown in Table B-7a.

PRELIMINARY SURVEYS

The preliminary survey shall closely traverse along a line previously flagged by the operator and approved by the appropriate FS or BLM representative. Certain areas such as benches, wet areas, etc. may require exact conformance to flagged lines. Bisecting cross sections shall be taken at breaks in terrain, drainage areas, and at 100-foot intervals sufficiently wide to cover the entire clearing limits of the future road. Complete terrain cover, drainage systems, soil type, and land ownership shall be noted during the Preliminary Centerline Survey. A complete site survey shall be made at each major stream crossing. Any existing facilities, either operating or abandoned, crossed by the Preliminary Centerline shall be documented by station and orientation. Examples are powerlines, pipelines, roads, trails, fences, etc.

The class of survey required shall be defined by the BLM District Engineer and/or FS Engineer.

DESIGN

Roads shall be designed by or under the direct supervision of a Registered Professional Engineer. BLM may on a case-by-case situation, waiver this option "out on the flats". It will be followed where any ridges and side slopes are involved. All roads will be laid out at least by an experienced land surveyor on BLM lands.

General geometric design criteria are shown in Table B-7a.

Roads should be designed with the purpose of fitting the roadway to the terrain. This procedure will result in minimizing earthwork and disturbed area. The designer shall attempt to create a balanced earthwork project, thus avoiding the need for borrow areas and waste areas. Special care must be taken to compensate for the incremental grade on all switchbacks by holding a maximum centerline grade of four percent throughout the length of the switchbacks.

SLOPE SELECTION

The cut and fill slopes shown in Table B-7b, should be used as a guide only. The slopes shall be adjusted to uneven ratios in transition sections to prevent a zigzag appearance at the slope catch points. The top of cut or toe of fill line should be a smooth line with gentle curves. Slope ratios shall not exceed the maximum stable slope as determined by the geotechnical investigation. In areas where cut or fill will be the construction method, cross sections will be required in the plans.

TABLE B-7b

CUT AND FILL SELECTION TABLE

Height (ft.)	Slope Ratio
0-5	3:1 (minimum)-BLM may require 6:1 ratio or larger
5-20	2:1
Over 10	1½:1

PAVEMENT STRUCTURE

The type and amount (depth) of road surfacing shall be determined by the engineer through a procedure based on projected traffic loadings, bearing capacity of the subgrade soils, and the anticipated loss due to traffic use and maintenance. A further factor which is to be considered is the time period in which the operator will be using the road. Section Period of Use of this document defines the consideration which must be given this factor.

The surfacing analysis shall be documented and shall become a part of the "road package" submitted to the FS or BLM for review and concurrence. If the minimum surfacing as stated under Forest and BLM Development Roads for arterials is used, documentation of this determination is not required.

An acceptable analysis may be as simple as comparing like soil types and structure depths (that are based on firm data from previous projects) to full laboratory analysis of subgrade materials using California Bearing Ratio (CBR) or R value tests. The level of analysis should be that necessary to assure the pavement structure depths will support the type of vehicle and volume of use anticipated. The depth of rock courses can be varied along the road to accommodate changes in subgrade bearing capacity.

TRAVELED WAY WIDTH

The width of the traveled way, i.e., the lane width plus shoulder width, is determined from Table B-7a. Accurate traffic projections combined with design speed or the facility are the determining factors for traveled way widths. The operator should establish the factors even prior to the time when road location efforts are undertaken, and review with and receive concurrence from the FS Engineer or BLM Authorized Officer prior to proceeding with the work. This information must be included in the road package when submitted to the FS or BLM (depending on land status) for review.

Curve widening shall be applied to the traveled way widths as required to accommodate the tracking characteristics of the design vehicle. The design vehicle shall be that vehicle commonly referred to as 3-3 or WB-50 as defined as AASHO.

CLEARING

Selective clearing may be required during earthwork to remove trees damaged by construction, particularly large trees at the top of cut slopes whose root systems protrude into the excavation zone. Care shall be exercised to prevent marring of trees by equipment. The Company will buy all timber on the road right-of-way.

All cleared material shall be disposed of through methods approved by the FS or BLM. Methods which may be approved are burning, burying outside the construction limits, decking of material for removal by the public for firewood, chipping, sale of merchantable timber to a mill, or other appropriate means, as suggested by the operator. The method to be utilized shall be identified in the construction plans and specifications.

DRAINAGE

Permanent drainage structures shall be installed to protect the road and adjacent watershed. Single lane roads shall have, as a minimum, armored drainage dips constructed in the roadbed to prevent water from channeling the road surface. Bridges, or occasionally culverts, shall be constructed in low flow drainages where stream and roadway geometrics permit. Culvert cross-drains shall be installed in all double-lane roads (drainage dips shall not be constructed on double-lane roads). They shall be located to accommodate natural drainage patterns and as ditch relief pipes. Culvert inlet basins will be required to install ditch relief pipes. The inlets shall have metal end sections and occasional elbows to provide proper installation. These pipes will extend to the toe of the fill slopes and erosion control devices or energy dissipators shall be utilized at the outlets.

Dips will be designed so that it will be apparent at the time the road is maintained that the dip is a permanent necessary feature of the road and is not an irregularity that can be smoothed out with a grader. Dips must be designed and not added as an afterthought. Slopes at the discharge point may need protection and should be greater than the slope of the road to prevent dips from filling with silt.

Where large natural drainage systems are encountered, a complete hydrological study of the system must be performed to predict the anticipated runoff.

As a minimum, culverts shall be designed for a 10-year flood (flow of 10-year recurrence interval) without a head at the entrance. They should also be designed to carry a 50-year flood without exceeding the allowable

headwater. The allowable headwater is the maximum water elevation for which the resulting flood damages are considered to be acceptable. Major culverts (end area greater than 35 square feet) and minor bridges (spans on the order of 30 feet or less) should be designed for a 20-year flood and checked for a 50-year flood. All other bridges should be designed to pass a 50-year flood and checked for a 100-year flood.

The hydrological study shall be included in the road package upon submittal to the FS or BLM for review and concurrence. After the road design is approved, five copies of the plans will be prepared and given to the FS or BLM.

CONSTRUCTION

STAKING

Construction controls will be staked on the ground for all roads. Staking will be in accordance with standard practices and include a marked centerline, Points of Intersection, clearing limits, cut and fill stakes, drainage structures, and reference hubs. The degree of construction staking will be determined by the FS engineer or BLM Authorized Officer. Minimum staking should include a referenced centerline, staked culverts and dips, and the cut catch point on slopes over 40 percent. Construction staking shall be done as described in Forest Service Standard Specifications for Roads and Bridges. No work shall commence until Forest Service or BLM approval of construction staking is completed.

QUALITY CONTROL

The operator has the responsibility to ensure that each road is constructed according to plans and specifications approved by the FS or BLM. Forest Service Standard Specifications for the Construction of Roads and Bridges shall be utilized to establish and maintain construction standards. Copies are available from the Forest Supervisor's Office. The degree of construction control should complement the survey and design methods utilized. Lower standard surveys and designs may require more intensive construction engineering to assure an acceptable end product.

The FS or BLM will make periodic inspections to ensure that each road is properly constructed, at which time control tests and charts maintained by the operator shall be made available for review. This shall include density tests, aggregate gradations, photographs showing construction techniques, daily diaries, etc.

The normally accepted tolerances between the designed and constructed road are as shown in Forest Service Standard Specification 203.

Tolerances should be indicated on the project plans.

ROAD MAINTENANCE

The lessee's Operations Plan shall include a maintenance plan for all roads constructed or used by the lessee.

Users of Forest Development Roads shall pay their fair share of maintenance costs, and use of Forest Roads will be approved by FS road permits. This includes roads which lead to the area where additional access is needed. Lessees may either perform actual maintenance activities or pay cooperative deposits as the FS approves. Before a bond release is signed, all road damage caused by the user shall be repaired in a manner approved by the FS (this will not apply to BLM lands).

The maintenance plan should have definite provisions for preventing undercutting of cut banks and the unnecessary removal of established stabilizing vegetation on fill side of road (operators should be given special instructions).

OBLITERATION OF TEMPORARY ROADS

Upon abandonment and prior to when a bond release is signed, temporary roads shall be obliterated. All or part of the obliteration techniques that follow could be used depending on the EIS/EA direction. Obliteration shall commence by stripping the gravel course from the roadway surface by means of a scraper or by windrowing with a motor patrol and removal with a loader and trucks. The gravel may be stockpiled at approved sites. After stripping

the ground, obliteration shall consist of rough grading, ripping or scarifying, cross ditching, and opening drainages to prevent erosion and encourage revegetation. The work shall not commence until after the temporary road is no longer needed to serve traffic.

After rough grading and ripping have been completed, the abandoned roadway shall be cross ditched.

Live streams and other drainages shall be opened by removing the abandoned structures and grading the approach fills so they will not impair the stream flow.

Abandoned structures shall be disposed of in agreed locations.

All obliterated areas shall be revegetated by applying seed and fertilizer mixtures as approved by the FS or BLM.

Roadways to be obliterated in high scenic quality areas will require more intensive procedures than those described above and may include such work as refilling cut slopes, removing fills, transplanting trees and shrubs, and other techniques deemed necessary to completely restore the area.

Culverts, bridges, construction signs, and other materials furnished by the operator will remain the property of the operator on obliterated roads.

APPENDIX C

FISHERIES AND SURFACE WATER QUALITY MONITORING PROGRAM

FISHERIES MONITORING PROGRAM

The monitoring program will be implemented to observe changes in fish habitat (including water quality) or fish populations that would be detrimental to the fishery. Should a change be observed that is linked to the applicant's development, the applicant will take corrective measures to eliminate the cause. The monitoring program will be set up in three major areas: 1) a site-specific monitoring station, 2) three or four long-term monitoring stations to observe cumulative well field development effects, and 3) annual reconnaissance of all applicant-constructed facilities to observe changes that could harm the fishery. The determination of the type of monitoring program will be made at the time a specific development site is located.

If the Wyoming Game and Fish Department (WGF), Forest Service (FS), and Bureau of Land Management (BLM) determine that the fishery resource may be affected as defined by the following significance criteria, a site-specific monitoring station(s) will be established downstream and upstream of the area of activity (i.e., well pads, pipeline crossing, access road, etc.). Sampling will be supervised by the WGF, FS, or BLM depending on the location of the site and the type of data to be collected.

FISHERIES SIGNIFICANCE CRITERIA

1. Impacts to fisheries resulting from accidental spills of chemicals are considered significant if changes in water quality exceed WDEQ water quality criteria or exceed toxic levels for aquatic life. These criteria were developed to protect aquatic life based on the Environmental Protection Agency (EPA) 1976 Quality Criteria for Water. For example, a sour gas pipeline break resulting in H_2S concentrations greater than 2 μg/liter in affected streams is considered significant.

2. Impacts to fisheries are considered significant if critical habitats (for example, spawning areas) are affected by increased sedimentation during critical months of fish use, April to June

for cutthroat trout and rainbow trout and September to November for brook trout and brown trout. Effects of sedimentation will be monitored at both site-specific and long-term monitoring stations. Effects will be determined by analyzing the results of water quality, benthic macroinvertebrate, trout habitat, and trout population studies as described in this monitoring plan.

3. Impacts to fisheries are considered significant if beaver ponds would be removed or lost; beaver ponds provide important habitat to fish during low flow periods and drought years. Impacts to beaver ponds will be evaluated during the annual reconnaissance of all applicant-constructed facilities as described in this monitoring plan.

4. Impacts to fisheries are considered significant if culverts at road crossings create barriers to fish movement; barriers can prevent normal movement of both adult and larval fish, increase predation, limit habitat availability and reproductive success, and ultimately decrease population numbers. Impacts due to culverts will be evaluated both after quarterly water quality/ benthic invertebrate sampling and during the annual reconnaissance of all applicant-constructed facilities.

5. Impacts to streams currently under special WGF and/or BLM management for Colorado cutthroat trout are considered significant. Disturbance to and near these streams could degrade existing habitat conditions, increase the risk of illegal fishing pressure, and threaten efforts to establish a naturally reproducing population of pure Colorado cutthroat.

6. Indirect impacts caused by human population increases are considered significant if the estimated increases in illegal fishing would be greater than or equal to 15 percent over expected baseline conditions. This significance criterion has been used in previous EISs (BLM 1983, Chevron Phosphate Project Draft EIS) and this increase is also considered significant by WGF biologists since any increase in fishing pressure both legal and illegal would tax the reproductive capabilities of the native and non-native trout population and also tax the existing enforcement and stocking capabilities of WGF.

MONITORING PARAMETERS

At both the site-specific monitoring stations and long-term monitoring stations the following parameters, as a minimum, will be measured and evaluated:

1. Sediment Loads. This can be measured for actual increases in sediment loads and/or changes in macroinvertebrate densities of sediment-intolerant species versus sediment-tolerant species.

2. Trout Habitat. Changes could be measured for a predetermined distance (perhaps 300 to 500 feet depending on stream width and

sampling a representative reach). Parameters measured will be water width, water depth, channel width (measured as described by Dunham and Collotzi, USFS, in their Transect Methodology handbook cited later in this appendix), bank erosion, and trout cover (measured using Habitat Quality Index methods). These measurements will be critical below and above construction that could change channel morphology, e.g., culverts, bridges.

3. Trout Populations. Trout population densities and standing crops will be measured primarily using electrofishing equipment. Population estimates will generally be made using the DeLury method. This work will be done by the WGF.

Additional parameters, if any, and their methods of measurement will be determined at the time the station is actually located. When a station is picked, baseline information will be collected before any work takes place. After the work is initiated, sampling should occur immediately afterwards, quarterly for at least one year, and then as long as the significance criteria require.

If potential development problems appear to be minimal or the area of low fishery value, an interagency agreed upon annual reconnaissance will suffice. This type of reconnaissance, defined and agreed to by the WGF, BLM, and FS, will determine if any problems are occurring (e.g., increased sediment loads), the location of the cause (e.g., erosion from a road), and ways to eliminate the problem (e.g., improve drainage system).

If a significant impact occurs, the applicant(s) will be required to take corrective measures as recommended by the FS, BLM, or WGF. A significant impact will be determined as a statistically significant change from the baseline information resulting from the development activity. The change measured could occur in one of the three aforementioned areas (sediment loads, trout populations, or trout habitat) or a combination of all three. It is important that all measurements use established interagency-approved methods that can be statistically tested and reproduced by different personnel. It is also important that all methods used be at least compatible, if not identical, with the methods used by ERT to collect baseline data. These methods are described in the following methodology section.

MONITORING METHODOLOGIES

Sediment Loads

Baseline benthic macroinvertebrate samples were collected in mid-August 1982. Monitoring sampling should be done quarterly with one quarter's sampling being conducted in mid-August. Sampling stations should correspond to those selected for the water quality monitoring. These stations are F-1, B-1, PG-1, and BC-1 (see the Wildlife and Fisheries Technical Report). Sampling will be supervised by the BLM or FS.

At each station three replicate samples will be collected from a riffle area, using a Surber square-foot bottom sampler with 240 μ/meter mesh netting. Bottom disturbance should be limited to no more than 60 seconds in order to correspond to the baseline method. The sampled contents will be placed into a wide-mouth polyethylene or polypropylene jar, preserve with 10 percent formalin and labelled. Samples will be shipped to a contracted laboratory for analyses.

Laboratory procedures should include rinsing the sample (to remove formalin) in a standard 30-mesh sieve and sorting and picking the organisms from the debris. Sorting is best accomplished using a white enameled pan. Sorted organisms are identified and enumerated using a 10 to 80X dissecting microscope. Chromonids and oligochaetes will be identified under a compound microscope. Identification should be to the lowest taxonomic level practical.

Data analysis should include mean density (numbers/square meter), species relative abundance (% RA), mean diversity ($\bar{d}$), and equitability (e). Mean diversity and equitability values should be calculated for each station using formulae and tables found in Weber (1973).

In addition to the above data analyses, an evaluation of the number of silt-tolerant species versus the silt-intolerant species should be made. This can be done by using the information found in Merritt and Cummins 1978.

References

Merritt, R. N. and K. W. Cummins (eds.). 1978. An introduction to the aquatic insects of North America. Kendall/Hunt Publishing Company, Dubuque, Iowa.

Weber, C. I. (ed.). 1973. Biological field and laboratory methods for measuring the quality of surface waters and effluents. U.S. Environmental Protection Agency, Cincinnati, Ohio.

Trout Habitat

No change in approach from the references below. Sampling will be supervised by the BLM or FS.

References:

Binns, N.A. Habitat quality index procedures manual. Wyoming Game and Fish Department, Cheyenne. 208 pp.

Dunham, D. and A. Collotzi. 1975. The transect method of stream habitat inventory. Guidelines and applications. U.S. Forest Service publication, Ogden, Utah.

Trout Populations

Trout population densities and standing crops will be measured primarily using electrofishing equipment. Population estimates should be made at least once per year both at established site-specific stations and at the long-term monitoring stations. The field effort should occur sometime in late summer or early fall when streamflows are down. Population estimates will generally be made according to DeLury 1947. This work will be performed by the WGF.

Reference:

DeLury, D. B. 1947. On the estimation of biological populations. Biometrics 3(4):145-167.

SURFACE WATER MONITORING PROGRAM

The surface water monitoring program is primarily intended to detect changes in water quality which may affect aquatic life. Additionally, the program will detect changes from baseline conditions which may indicate the need for more extensive monitoring. Sampling will be supervised by the BLM or FS.

Stream sampling locations will include the four established stations in the well field on Fish Creek, Beaver Creek, Pine Grove Creek, and Black Canyon Creek as well as others that may be specified by the Authorized Officer. These stations will coincide with locations for aquatic monitoring stations (Stations F-1, B-1, PG-1, BC-1, see Wildlife and Fisheries Technical Report).

The following parameters will be measured monthly:

- discharge
- temperature
- specific conductance
- dissolved oxygen
- pH
- turbidity
- alkalinity
- total suspended solids (TSS)

Discharge should be measured using a direct-reading Marsh-McBirney current meter according to USGS methodology (Techniques of Water-Resources Investigations of the United States Gological Survey, Discharge Measurements at Gaging Stations, Book 3, Chapter A8, USGS 1976). All other parameters follow APHA 1980, except dissolved oxygen which should be measured using a meter instead of the Winkler method. All parameters except TSS will be measured on-site. A one-liter TSS sample will be sent to a laboratory for analysis by weight.

The following parameters will be measured quarterly, concurrent with aquatic monitoring:

- total dissolved solids (TDS)
- total alkalinity
- chromium
- copper
- bicarbonate
- carbonate
- sulfate
- sulfide
- aluminum
- arsenic
- barium
- cadmium
- calcium
- lead
- magnesium
- manganese

- phosphate
- nitrate
- specific conductance
- pH
- oil and grease
- potassium
- selenium
- silica
- sodium
- zinc

Quarterly samples of water chemistry parameters will be measured by laboratory analyses of stream samples. These analyses will be performed in accordance with methods specified by Standard Methods for Examination of Water and Wastewater, 15th Edition, 1980; APHA-AWWA-WPCF.

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